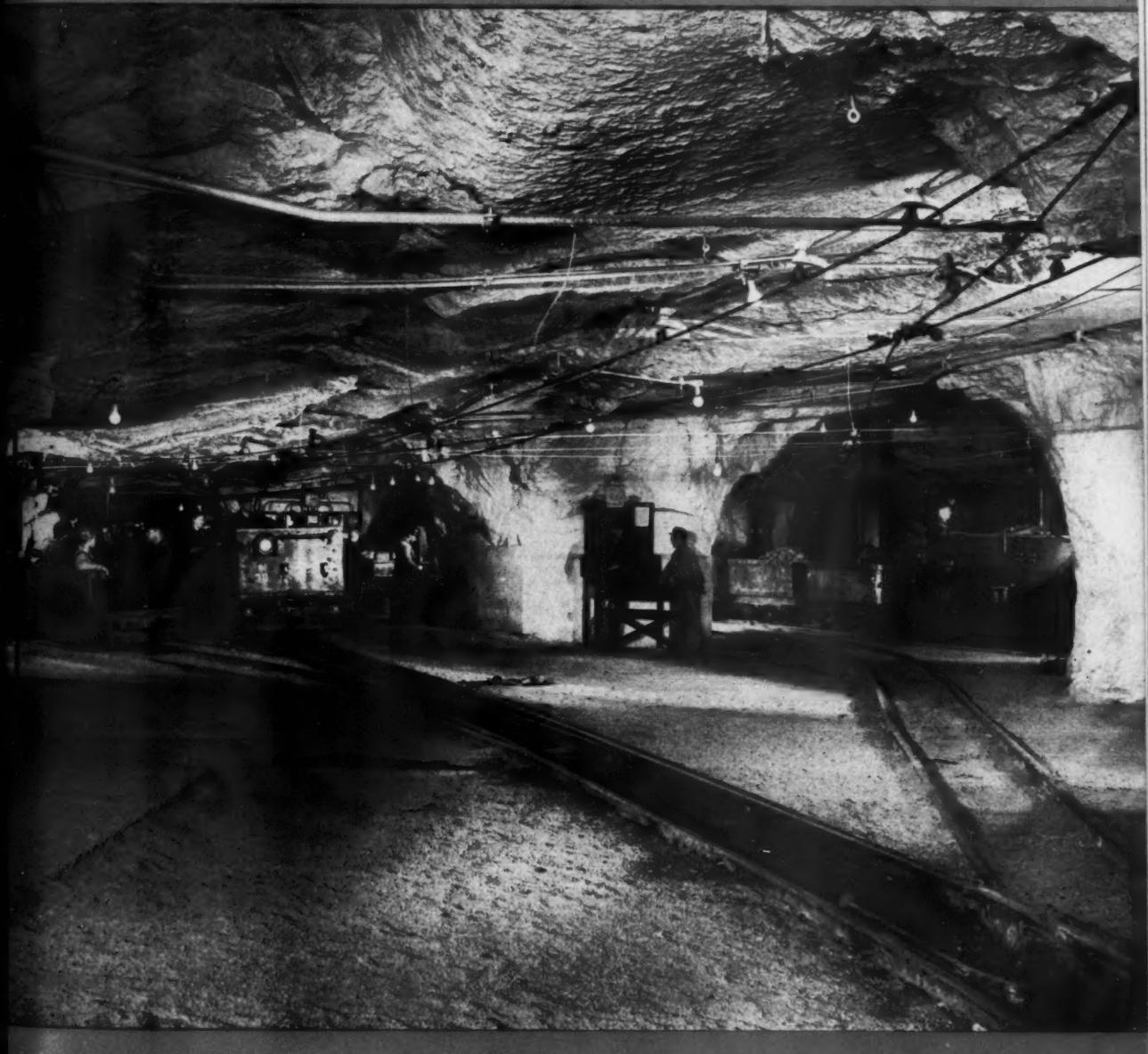


Mining

CONGRESS JOURNAL



JULY
1951



LINK-BELT engineering experience...

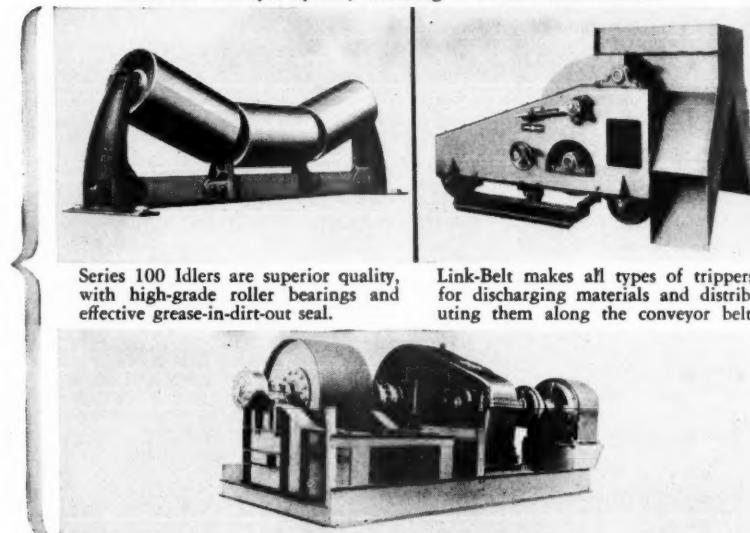
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LINK-BELT quality components...

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your best buy
in BELT
CONVEYORS



Washed iron ore is stocked out and reclaimed by means of a Link-Belt belt conveyor system, including a 60-foot radius stacker.



Series 100 Idlers are superior quality, with high-grade roller bearings and effective grease-in-dirt-out seal.

Link-Belt makes all types of trippers for discharging materials and distributing them along the conveyor belt.

Link-Belt power transmission equipment meets every conveyor need. Shown here: Link-Belt 300 H.P. fluid coupling drive and D-250 herringbone gear reducer.

YES, you get *both*—practical engineering and quality components—when you call on Link-Belt for belt conveyors! Thousands agree Link-Belt makes the finest belt conveyors on the market today.

Engineering experience? Our conveyor specialists draw on an accumulation of years of materials handling and power transmission experience. They will help you and your consultants get top performance from a modern conveying system.

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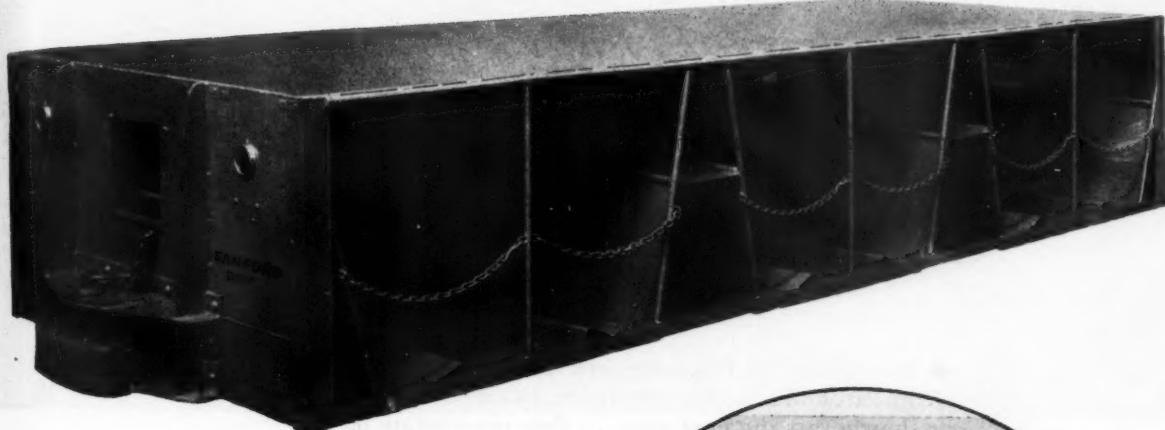
Remember, there's a Link-Belt conveying specialist in the branch office near you. Call him for complete engineering information.

LINK-BELT

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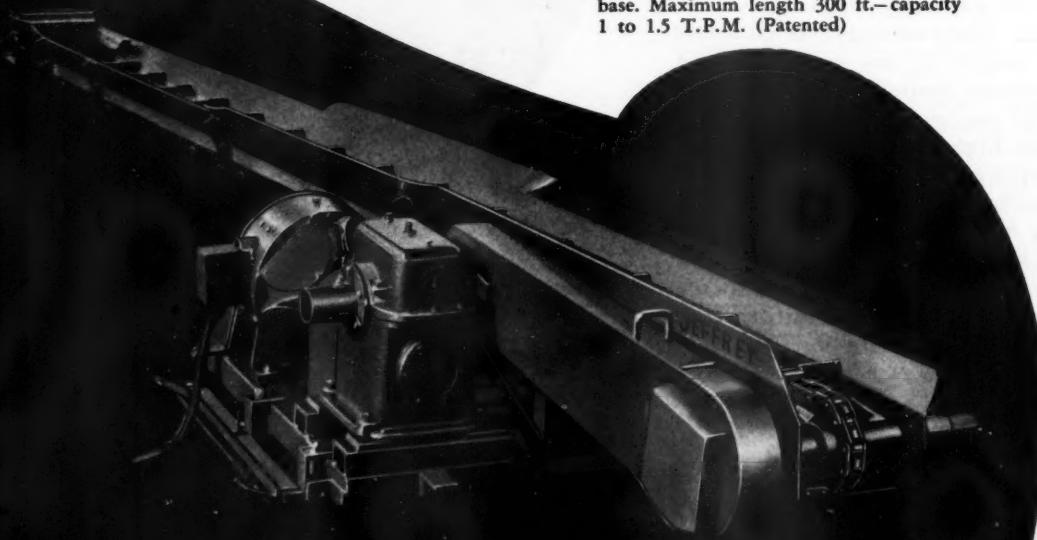
*for Bituminous and
Anthracite Mining*

● Our Conveyor Engineers are specialists. They do not change around . . . conveyors today, locomotives tomorrow or shuttle cars the next day . . . they concentrate on conveyors. That is their business. They develop, design and build for you.

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Jeffrey 61-AM Room Conveyor with power unit mounted at side on leveling base. Maximum length 300 ft.—capacity 1 to 1.5 T.P.M. (Patented)





The view above shows a Jeffrey 61-AM Room Conveyor (Chain Type) going through to and discharging into a Jeffrey gathering conveyor. Also in this illustration you will see a typical installation of a Jeffrey Type 61 Blower. Yes, Jeffrey goes underground in a big way . . . more often than not you'll find two, three or more machines in one mine doing a tremendous job of keeping coal on the move. For Conveyors—send for Catalog No. 820, which tells all.

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LOCOMOTIVES

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HIGH

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LOW



FEATURES
OF THIS
METAL MINE LOCOMOTIVE

Where track is permanent and trolley wire serves as the source of power, this 8-ton, two motor locomotive handles the haulage job. In working areas where track is temporary and it is inadvisable to extend the trolley wire because of loading chutes, extremely wet conditions or bad roof, this same locomotive operates from the cable reel.

- Transverse equalizers for smooth performance on all types of track
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- Accessible brake rigging
- Sand boxes filled from outside frame
- Two 40 hp. motors
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- 24" to 36" gauge, 60" wheelbase
- Selective series or parallel camtactor type controller

When production costs are being analyzed, it will pay you to check details of your transportation system. Let a Goodman sales engineer help you.

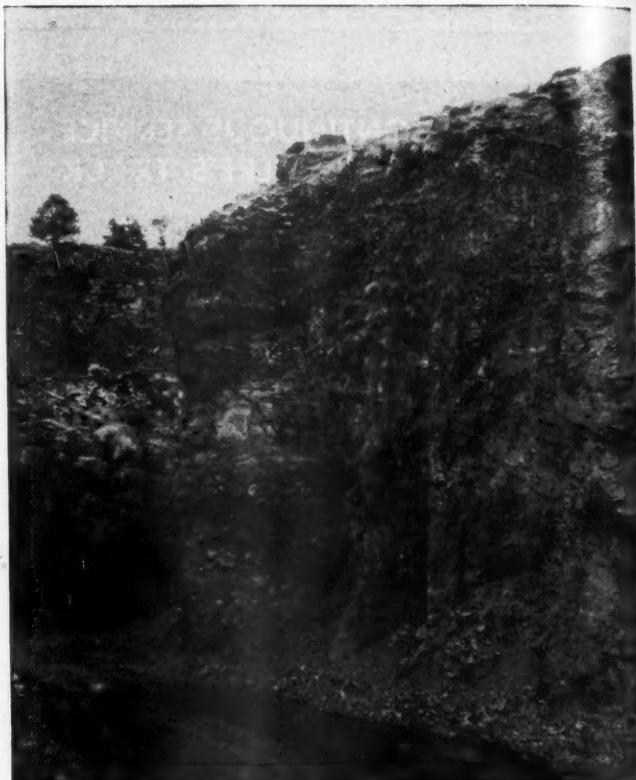
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Here is the reason



behind
machine-gun
camera

photos like this
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Ask your Atlas representative to show you machine-gun camera photos of other types of blasting, so that you can gain from Atlas' wide experience in pioneering split-second delay blasting. Ask him, too, or write us, for the ROCKMASTER Booklet, showing typical loading diagrams for blasting rock, coal, ore . . . on the surface or underground.



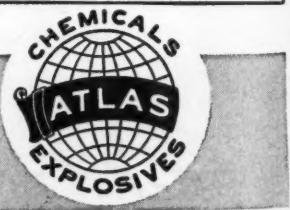
ROCKMASTER "16" TIMINGS

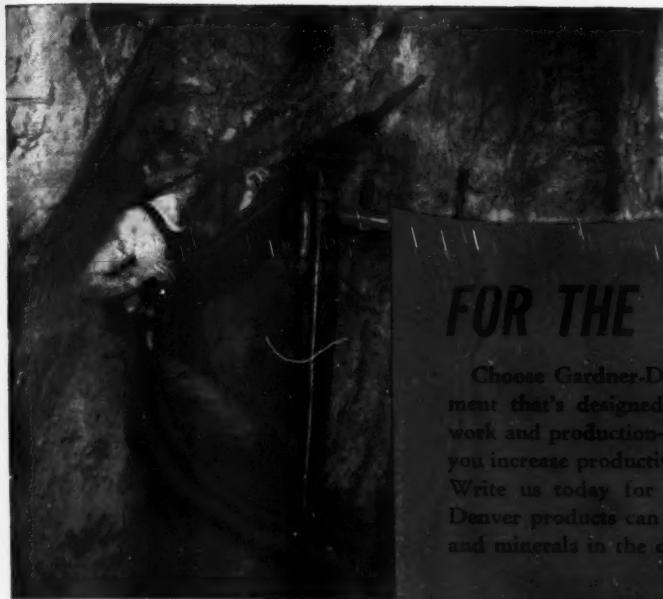
Rockmaster No.	Avg. Time of Each Delay from Zero (milli-seconds)
0 (zero)	0 (inst.)
1	8
2	25
3	50
4	75
5	100
6	125
7	150
8	175
9	200
10	250
11	300
12	350
13	400
14	450
15	500
16	550

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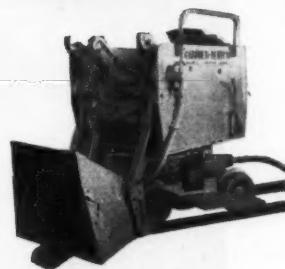


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Choose Gardner-Denver—and you choose quality mining equipment that's designed by experts to help you speed development work and production—to help you hold down mining costs—to help you increase productivity, even among your less experienced miners. Write us today for further information on how these Gardner-Denver products can help you boost production of essential metals and minerals in the critical days ahead.



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Mine Car Loaders



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In every Weight Class



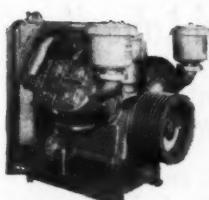
Lightweight
F12 Air Feed Leg



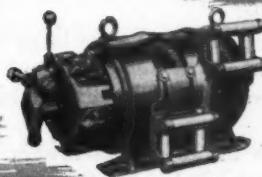
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G16 Sharpener
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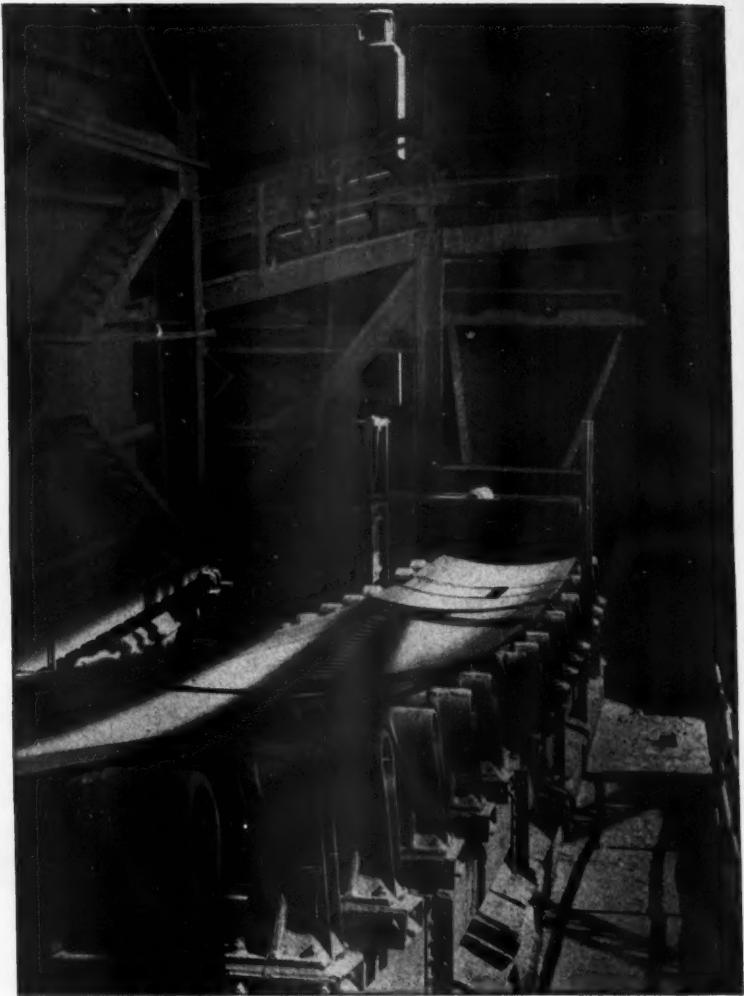
And Still Going Strong

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For more than twenty-five years this S-A heavy duty belt conveyor system has been moving crushed ore on the most economical cost-per-ton basis.

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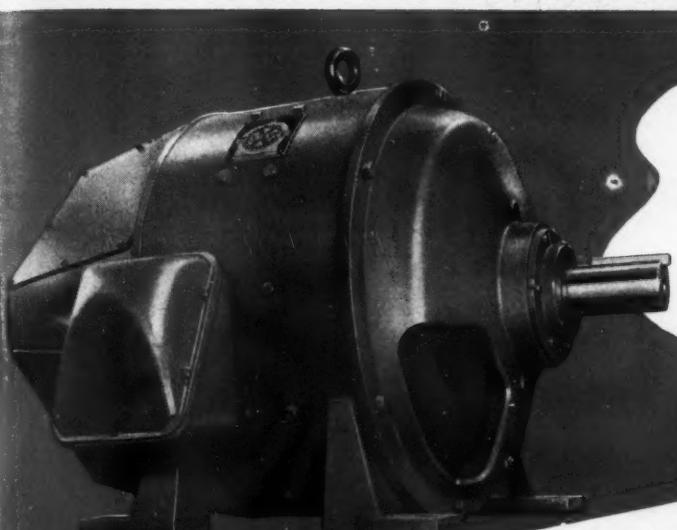
SOUTH AMERICAN COPPER MINE

Photo shows a transfer point between two 60-inch wide belt conveyors handling primary crushed ore. Belt carriers used on these conveyors are S-A "Mammoth" type weighing 950 pounds each which make them the heaviest and most rugged pieces of equipment of this type in the world. Belt conveyor in foreground moves ore in large volume up to secondary crushing plant.



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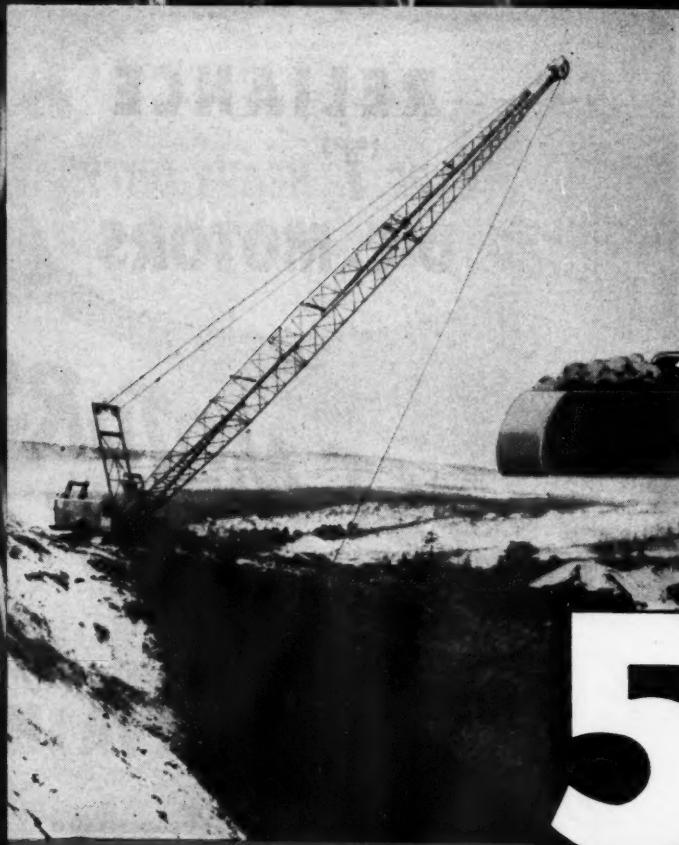


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5

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It **HUGS DRUM**

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It STANDS UP

It's EASY

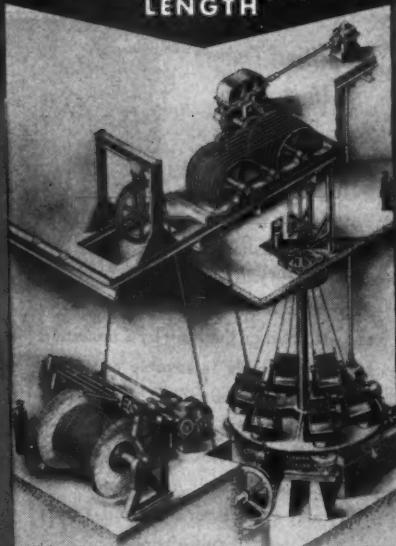
Under Severe Operating Stresses

Operating in dry dirt, wet dirt, sand, gravel, rock and minerals and on all types of equipment, Tuffy Draglines stand up under more days of service and move far more yardage than the best previous average obtained by many operators.

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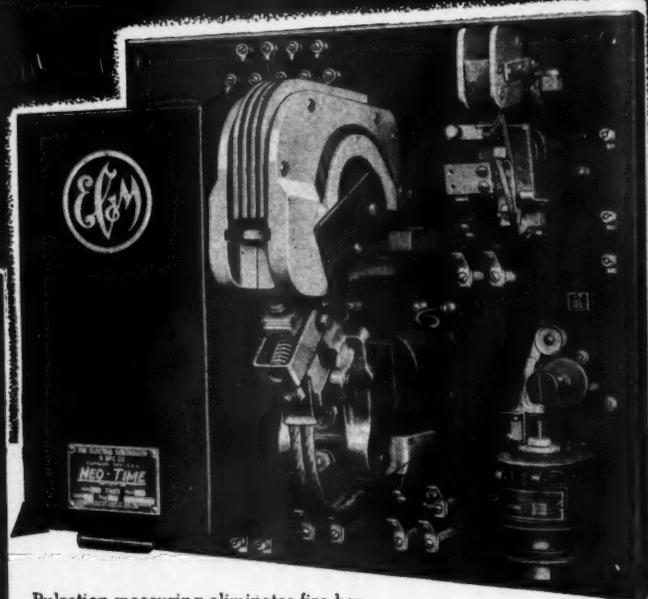
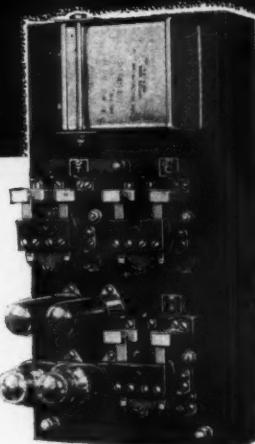
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Recloses on **SAFE** Loads

Simplified Timer in Unit Form

Total over-all interval of "on-off" testing is 15 seconds or more, and is provided by a simple timer having front connected terminals and attached on the front by 2 mounting screws. Quickly removable as a unit. These sectionalizers can be operated without the load-measuring feature—turning manual reset knob on overload relay disconnects timer—allows overload relay to lock-out for manual reset after tripping. Turning knob to original position reconnects timer for automatic operation.



Pulsation-measuring eliminates fire hazards and shock—STUB-END feeders fully protected—production improved.

SAFEGUARDS 230, 275 and 550 volt D-c Stub-end feeders **automatically**. Opens on overload, short circuit or voltage failure. Recloses by intermittently pre-testing load side with new circuit of low amperage. Load-measuring voltage less than 50 volts. Feeler current on for 0.8 seconds—off for 2½ seconds before feeler current is reapplied. Coal dust heated by any arc produced by a fault cools faster than it is heated by the pulses of the feeler current.

There's nothing like these new EC&M Automatic Reclosing Sectionalizers. They accurately discriminate between short circuits and loads of low value. Note, too, the compactness and low headroom construction—ideal for mine service.



Drip-tight enclosure with bulb's eye over pilot lamp and hinged cover over push button.



THE ELECTRIC CONTROLLER & MFG. CO.
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Steps up efficiency of walking dragline...

LUBRICATION of the walking cams on a 13-ton dragline proved troublesome for operators of the Sherwood-Templeton Coal Company, Linton, Indiana. Various lubricants tried on the cams were difficult to apply because they required heating for application. Also, lubricants tended to run off cams, thus failed to give adequate lubrication, caused high lubricant consumption, created hazardous working conditions around the walking cams.

A Standard Oil lubrication specialist recommended Standard Oil's **HEAVY-DUTY CAM AND GEAR LUBRICANT** for this job. A trial clearly indicated the advantages offered by this product. Because the **HEAVY-DUTY CAM AND GEAR LUBRICANT** can be easily removed from paper-type cartons and applied in solid form, application was handled with minimum time and labor during moving operations. The lubricant spread readily when cams rolled over but did not tend to run off. It formed a strong lubricating cushion that minimized vibration of the walking cams.



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The experience of the Sherwood-Templeton Coal Company points to savings you can make through the use of Standard Oil's lubrication engineering service and high quality products. How you can easily and quickly put this lubrication service to work for you is explained at the right.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.

What's YOUR problem?



Kenneth Dix, of Standard Oil's Evansville, Indiana, office, is the Standard Oil lubrication specialist who was called in by operators of the Sherwood-Templeton Coal Company. His practical experience and special training enabled him to recommend a lubricant that solved this company's lubrication problem and brought about important savings.

Kenneth Dix is one of a corps of Standard Oil lubrication specialists located throughout the Midwest. These men are especially trained to help you with your plant's lubrication problems. To obtain the prompt, on-the-spot services of an experienced lubrication specialist, phone or write to your local Standard Oil Company (Indiana) office.

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SUPERLA Mine Lubricants—These new, improved oils and greases provide better lubrication of cutters, loaders, locomotives, mine cars, and other underground equipment. They eliminate transmission-case deposits, reduce clutch-plate gumming, and minimize wear on gears and bearings.

CALUMET Viscous Lubricants—On open gears and wire rope, these greases resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

STANDARD OIL COMPANY (INDIANA)



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AXIVANE[®] FANS

*Do ALL your Ventilating
Jobs MORE EFFICIENTLY!*



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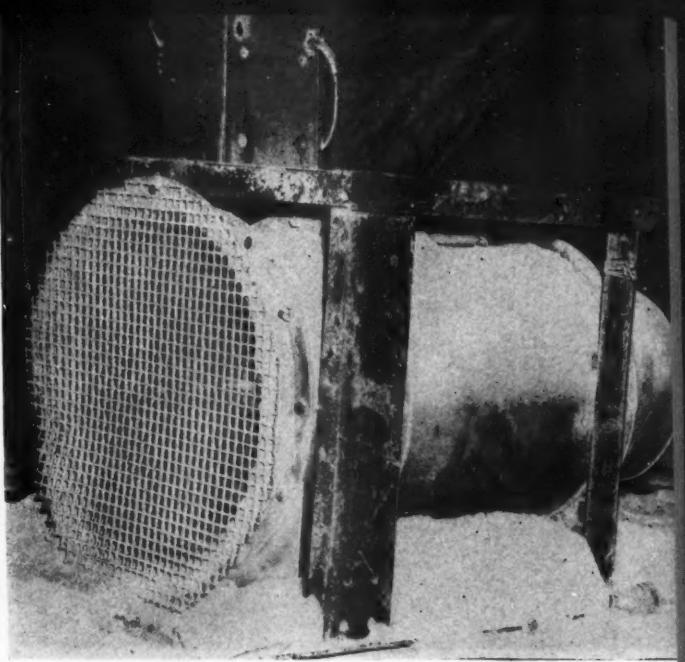
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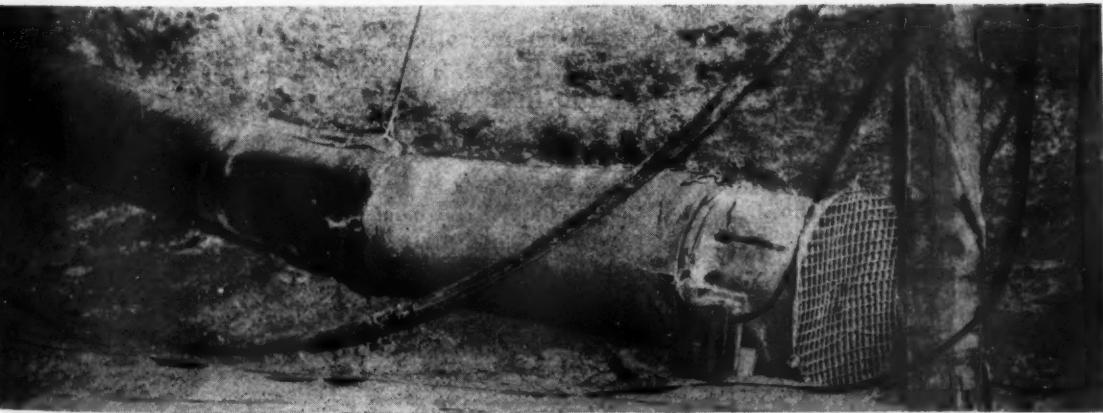
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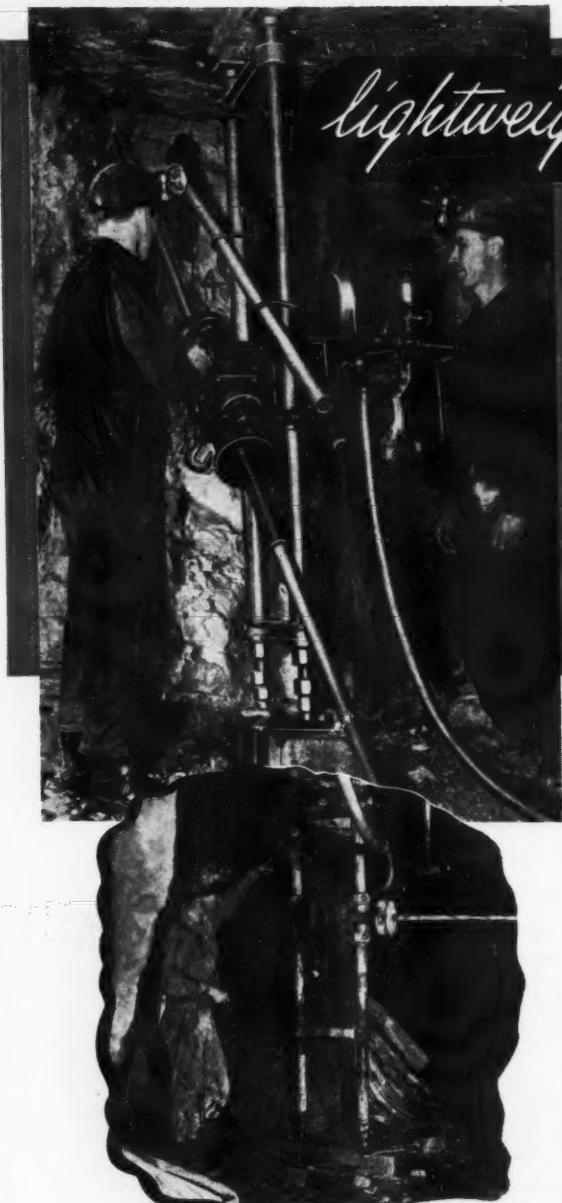
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DESIGNED FOR TOMORROW



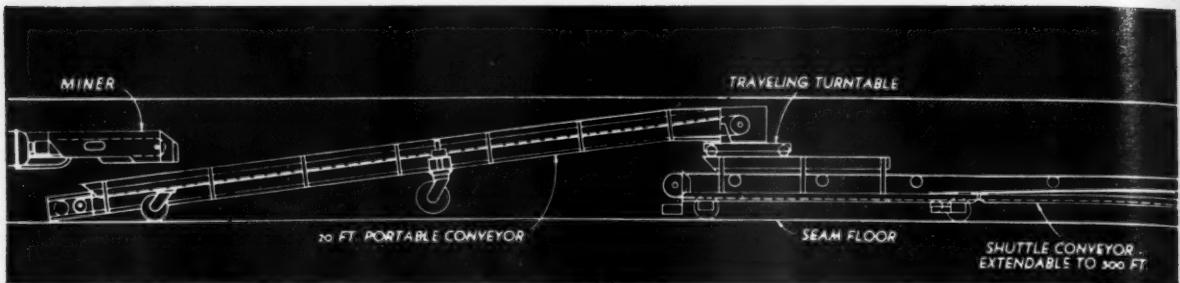
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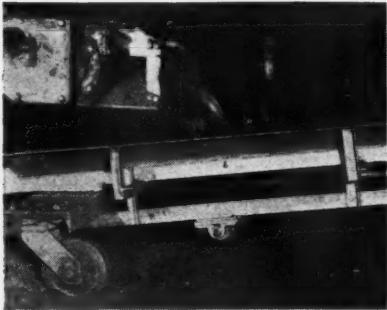
WISCONSIN



Continuous Coal Production

FROM FACE TO PREPARATION PLANT!

Hewitt-Robins Belt Conveyor Mining Method takes coal from the face continuously as fast as any mechanism can produce it...and can lower your transportation costs!



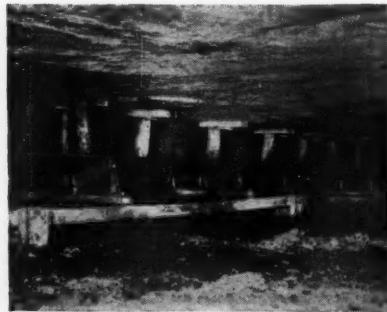
AT THE FACE, a portable Belt Conveyor takes coal continuously as fast as any machinery can produce and discharge it. The unit can be used in coal as low as 30°. Rubber-tired, free-swinging casters make the portable easy to move and handle.



FROM THE FACE, the portable unit feeds the coal directly onto a shuttle Belt Conveyor. The latter consists of 8' pin-connected intermediate sections, each equipped with a pair of rubber-tired wheels. A covered deck protects the return strand of the Belt.



TO TRANSFER CONVEYOR. The shuttle Belt Conveyor delivers the coal onto a transfer Conveyor at a fixed-point discharge unit. The discharge pulley can be lowered when moving to another room or entry or when advancing the unit.



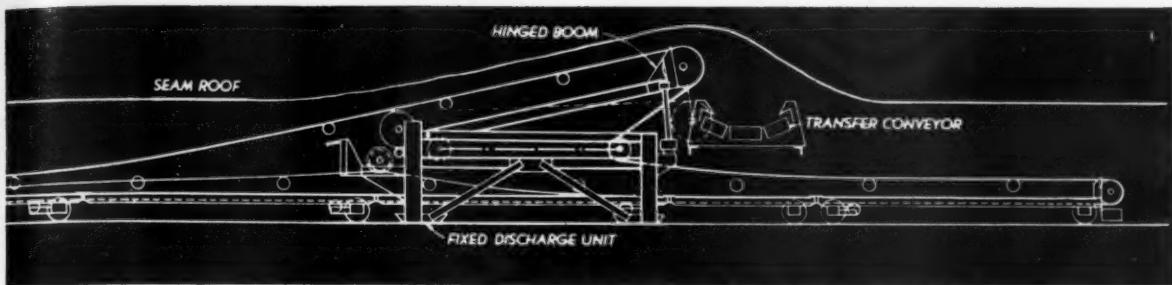
TO PANEL-ENTRY CONVEYOR. The transfer Conveyor feeds the coal onto a panel-entry Mine Conveyor. The latter is assembled with 8' or 10' intermediate sections of 26°, 30° or 36° width or wider. Sections are made for drop-in assembly; easily installed and extended.



TO MAIN HAULAGE CONVEYOR. The panel-entry Conveyor discharges the coal onto a main line Belt Conveyor system which consists of multiple tandem units assembled from 12' rigid intermediate sections. Such systems provide haulage from 500' to 5000'.



INTO PREPARATION PLANT. The coal is delivered from the main haulage system onto a slope Belt Conveyor (inclined or declined) for transfer into the preparation plant. From start to finish, coal transportation is continuous, fast, economical.



This schematic drawing indicates how coal moves continuously from face to transfer point.

The Hewitt-Robins Belt Conveyor Mining Method gives you genuinely continuous output—from face to preparation plant—and can lower your transportation costs. Whether your seam is 30" or 42" or higher, coal can be taken from the face continuously as fast as any mechanism can produce it.

AT THE FACE. Here the compact portable Belt Conveyor handles coal on a 24" Belt directly from any loading machinery. It is independently powered and controlled. The portable swivels in a 45° arc to right or left on the traveling carriage mounted on its discharge end—and also advances as face-cutting progresses.

FROM THE FACE. The portable feeds directly onto a rubber-tired shuttle Belt Conveyor, an extendable traversing unit using 24" wide Belt (minimum) and capable of handling up to 250 tons per hour. Lengths up to 500' can be supplied.

The shuttle Belt Conveyor is moved forward with the face by a rope haul. It receives coal from the portable or directly from the miner. Delivery to a transfer Conveyor is by means of a fixed-point discharge unit. The discharge at this fixed point can be adjusted for height to assure proper transfer of coal. It can also be lowered when transporting the unit from one room or entry to another in 30" or 40" coal—as well as for advancing in the entry being worked, without taking roof or bottom.

As long as coal is up ahead to be removed, the shuttle Belt Conveyor moves forward to get it, while the stationary discharge unit keeps transferring it. As the working end of the Conveyor advances in-by toward the face, the storage conveyor length extended out-by at the fixed-point discharge unit is utilized to keep pace with progress at the face. Extra storage length for an entire working shift can

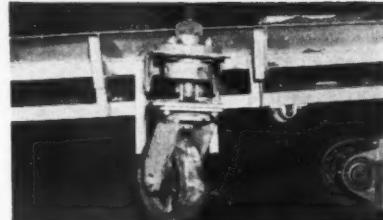
be assembled and installed with no interruption in output.

FROM TRANSFER POINT. Coal can be moved continuously to the foot of the slope by Hewitt-Robins standard panel-entry Mine Conveyor or other transverse Conveyor medium.

INTO PREPARATION PLANT. To assure continuous coal delivery—at low transportation cost—the panel-entry Mine Conveyor delivers to a Hewitt-Robins main haulage Belt Conveyor, then transfers it to a slope Belt Conveyor for movement into the preparation plant.

GET COAL CONTINUOUSLY . . . from the plant—at low cost. Use the Hewitt-Robins Belt Conveyor mining method. Hewitt-Robins Mine Conveyors are sold as standard package-units. Both Troughing and Return Idlers are adjustable for Belt training, have anti-friction bearings and the Hewitt-Robins one-shot lubrication feature. Lagged pulleys assure maximum power transmission.

Only Hewitt-Robins manufactures both machinery and belt. Only Hewitt-Robins can provide—from within its own corporate structure—every element of successful Belt Conveyor performance . . . from designing and engineering through manufacture and erection. Write for Bulletin No. 153 containing details of the Hewitt-Robins Belt Conveyor mining method. Address: Hewitt-Robins Incorporated, 1010 Pennsylvania Ave., Charleston, W. Va., or 270 Passaic Ave., Passaic, New Jersey.



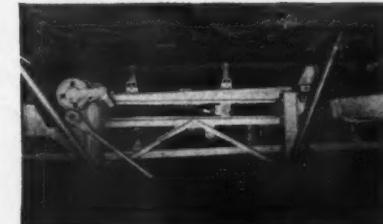
THE PORTABLE rises clear of the shuttle Belt Conveyor and swivels on its own discharge end. A pair of vertically-adjustable auxiliary casters, normally above bottom while the portable is in operation, are lowered when the unit is moved separately.



THE SHUTTLE BELT CONVEYOR traverses backward and forward on rubber-tired, anti-friction bearing wheels. Flanged wheels can be supplied for use on prefabricated light track. Idlers for return strand of Belt are dropped in easily. Note rope-haul anchor.



VERTICAL GUIDE PULLEYS, equipped with anti-friction bearings and mounted on standard roof jacks, are installed with staggered spacing of approximately 30' to maintain accurate alignment of the Belt when rubber-tired casters are used.



THE FIXED-POINT DISCHARGE UNIT of the shuttle Belt Conveyor is equipped with all operating and traversing controls as well as Takeup. Push-button control is also provided adjacent to the miner. Complete control of all operations is doubly positioned for top efficiency.

Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation.

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MINE CONVEYORS

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higher
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THE free world needs a lot of copper, iron, nickel — whatever you mine. So don't let manpower problems curtail your production. Give your miners a helping hand. Equip them with Le Roi-CLEVELAND Air-feed Sinker Drills—and watch the increase in tonnages per man-shift, the improvement in drilling costs.

Here's why miners get more done with Le Roi-CLEVELAND Air-feed Sinker Drills

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Drilling speeds are high — the fast, light blows of Le Roi-CLEVELAND Air-feed Sinker Drills are just right for carbide bits. You get maximum bit life — this lets you use smaller bits for higher drilling speeds.

Note — in addition to more footage per shift and more tonnage per man you get these extras: extremely low air consumption — and maintenance costs that are 50% less than those of a drifter.

Le Roi-CLEVELAND Air-feed Sinker Drills are available in two sizes — the HC10R using the popular 45-lb. H10 drill and the HC23R with the 3½-inch bore H23 machine. Write today for complete information.



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Mining

CONGRESS JOURNAL

Published for the Entire Mining Industry

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G.A.W.C.

THE National Production Authority's Office of Public Information has recently issued a booklet entitled "Allotment Accounting for Consumers under CMP." This manual sets forth the records a consumer of steel, copper and aluminum must establish and maintain to account for the allotments of these metals he receives under the Controlled Materials Plan.

What at first would appear to be an involved accounting process is stripped of its awe-inspiring complications and is reduced to its least common denominator through the drawings and explanations in this booklet. Those who compiled it are to be highly commended for their work.

Now what is needed is some similar clarification of the route by which the small mines, those who might produce the strategic metals and minerals so badly needed by the country, can get the aid for exploration, expansion and development which has been promised them.

A mathematical formula has been proposed to portray the situation as it now stands.

DMA + USBM + USGS + Secy. of Interior + DPA + GSA = -2 (?)
OPS + Budget

This is undoubtedly a tongue-in-cheek approach but the irony lies in the sad truth it conveys. The gauntlet that each earnest miner has to run almost makes the tribulations of early day prospectors who ran afoul of the Apaches seem like pleasant picnic experiences. He must be a hardy soul indeed who follows through to the end his application for help to bring in a new mine or rehabilitate an old one. He must have all the vision and pertinacity of the old time desert rat who spent a life time searching for the Lost Dutchman. Miners are like that even in this day and age, so some will eventually get assistance. But we need these metals and minerals NOW. We cannot afford the time necessary to exhaust the multiplicity of steps, to get to the other end of that line of warriors who stab and club at the hapless miner in his search for aid.

There is not the slightest doubt that screening is

necessary. Every one who applies for a loan is not a simon-pure patriot. It is also true that those who are doing the screening are honest, hard-working patriots zealously guarding the public funds from just such opportunists.

This brings us back to the original premise, that a drastic simplification of the line of command is necessary. Under the direction of James Boyd the number of steps required to process individual actions has been materially reduced. Existing governmental agencies, the Geological Survey and the Bureau of Mines have been welded into a working team with the Defense Minerals Administration. The forces of both "old-line" agencies are busy in the field preparing many cases for action when programming is sufficiently well-advanced to permit it.

The rub seems to be at the policy-making level. There the basic decisions are not made by mining men who can read and evaluate a mine examination report. There isn't a single mining man on the immediate staff of the Interior Secretary's office. With policy being made by men who don't know a mine from a hole in the ground, and no clear-cut lines of authority laid down, it is small wonder that the processing of applications has been painfully slow. The demands of the Budget Bureau that any recipient of a matched-funds contract put up his entire share from current assets at the very beginning no matter how long the contract is to run manifestly eliminates many potential producers. The quibbling of the General Services Administration over relatively unimportant details of purchase contracts has greatly retarded the minerals program. The Treasury Department objects to the principle of accelerated amortization on the grounds that taxes would be lost during the early years of operation of facilities erected with such aid. They seem to think a baby bird in the hand is worth more than a Roe in the bush which might be paying larger taxes later. This short-sighted policy has stymied another phase of mining expansion program.

All these conflicting policies and lack of coordination in the many steps necessary to get aid in the forms promised under the Defense Production Act of 1950 call for the firm hand of someone conversant with mining, to make wise and just policy decisions and expedite the processing of legitimate requests for assistance in bringing into production the new mines and increasing the output of mines already established. It also requires the establishment of a unified organization, composed of mining men, combining the authority now spread over more than 30 agencies, if increased production of metals and minerals is to be achieved and the defense effort expedited. When such a man or group of men is finally put in the command of the mining program then the "Gosh Are We Confused" fraternity will be able to change its emblem from G.A.W.C. to N.W.A.I.B. ("Now We Are In Business").



Leading producer of molybdenum is situated in Colorado's mountains, at an elevation of 11,000 ft.

Climax Slushing Practices

Part I—Changes in Finger, Slusher Drift and Hoist Design Are Described

By WM. K. McGLOTHLIN
Mine Superintendent
and
ROBERT HENDERSON
Climax Molybdenum Co.

MECHANICAL loading or slushing was started at Climax about 15 years ago. The original mining was done using shrinkage methods. The next major change in the method of mining was the development of a caving system with grizzlies and chutes. Finally, slusher hoists were installed under a caved block.

The Phillipson Level, which is the present mining level, was initially developed to use the chute and grizzly system and some of the ore is still being worked by this method. The first slushers were installed on this level in 1936 and since that time have produced approximately 27,500,000 tons of ore. The decision to change from chutes and grizzlies to the slushing system was the result of a careful study of the many factors involved.

The size of the rock in the cave is one of the most important factors to be considered in determining the

method to be used. Here, the caved rock is commonly quite large and requires much secondary blasting. In the chute and grizzly system, these large rocks are broken by blasting to pass through the grizzlies. With the 28 or 30-in. spacing between grizzly rails, the material to be handled at the chutes is still large and necessitates much maintenance work. In the slusher system larger material is handled more easily and leads to improved costs, safety and efficiency.

The first hoist and hopper cutouts on the old White Level were made directly over the haulage ways. These cutouts, 20 ft high, 12 ft wide and 15 ft along the center line of the slusher drifts, were timbered and steel plate was installed to protect the timber in the slusher drifts. The hoists were mounted at the top of the cutouts and the scrapers discharged muck into cars directly under them.

On the Phillipson Level, the first 8 by 8 ft slusher drifts were driven at right angles to, directly over and on both sides of the 9 by 12 ft haulage drifts, on 75 ft centers. This spacing was later reduced to 50 ft to improve stoping and draw point spacing. The first prefabricated steel hoppers, made of $\frac{3}{8}$ -in. plate, were 3 ft high, 10 ft wide inside and 34 ft long. Later improvements changed these dimensions to 4.5 by 17 by 8 ft, with 60-lb rail welded on the inside of the girders to protect them from large rock.

Slusher hoists at first were mounted



Ore is scraped from slusher drift into 200-cu-ft Granby type mine cars in loading drift

at either end of the 34-ft girders in such a way that they could pull from but one extension of the slusher drifts. In order to draw ore from the opposite site extension, the hoists had to be reset at the other end of the girders. When the 17-ft girders were installed, the hoists were mounted directly over the haulage drifts and could be changed to pull from either side of the drift merely by changing the ropes and location of the nose sheave. At the present time, the standard layout is to drive single-ended slusher drifts—staggered so that half extend on one side of the haulage drift and half on the other. These drifts are spaced on 33.5-ft centers along the haulage drift. The cutouts are completely concreted in these drifts with the exception of the steel discharge aprons. Permanent concrete hoist foundations are put in each cutout on the opposite side of the drawhole from the slusher drift itself. In the original cutouts, two openings or "lean-tos" were driven, one on either side of the steel hoppers, to allow for manways, ventilation and storage of materials. In the concreted cutouts, only one lean-to is put in on the fresh air side of the haulage way. Platforms in these lean-tos were previously timbered; now, war surplus steel landing strip is installed to reduce maintenance and improve ventilation.

Some of the first slusher drifts were driven from the hoist cutouts on an incline of 10-15 percent. In most cases, they extended 100 ft on either side of the haulage drifts. In a few cases, slusher drifts have been driven 150 ft long in locations near the bound-

daries of the ore body or along the footwall. It has been found, however, that the 100-ft slusher drifts are the most economical for loading directly into cars. The old inclined slusher drifts presented a hazard to the men working at the fingers because of the tendency of the rock to roll down the incline. Other disadvantages noted with the inclined drifts were high cable wear and poor visibility. The new single-ended slusher drifts are driven level, 9 ft wide by 11.5 ft high and concreted 7 ft wide by 9.5 ft high. It is believed that these staggered, single-ended slusher drifts will improve draw control, ventilation and maintenance as well as making it possible to draw from all of the fingers in the area caved at the same time without having to change the hoists from one side of the slusher drifts to the other.

Concrete for Support

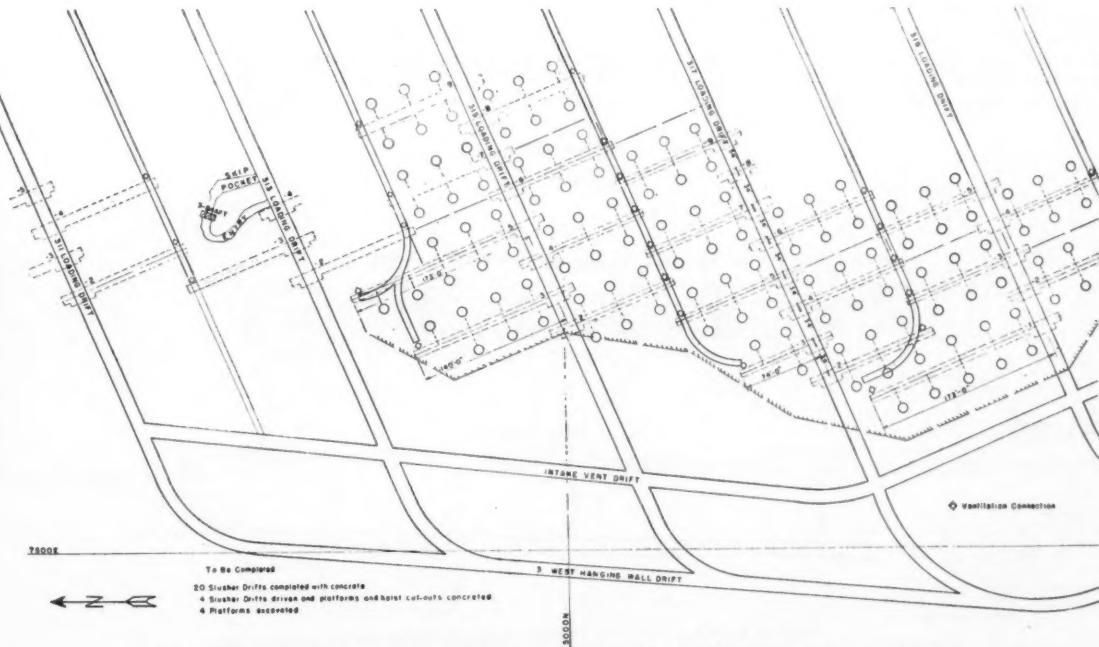
The first slusher drift fingers were driven on 50-ft centers. The cross-sectional dimensions were 5 by 5 ft and the slope angle was 45 deg from the horizontal. Fingers were driven on both sides of the slusher drifts directly opposite each other. Heavy blasting in the slusher drift fingers loosened the fractured rock and, with no support, the fingers soon became dangerously large. In certain cases the pillars over the drifts at the fingers were lost. Timber and steel sets were tried for supporting the rock with little success as the lagging and blocking were soon loosened and knocked out, leaving the backs and sides with no protection. The large scrapers dug out the bottoms around

the posts which were then pulled out. When the slusher drifts were changed to a 50-ft spacing along the haulage way, the fingers were driven on one side of the slusher drifts only, to eliminate losing the pillars at the fingers and to improve safety.

At first only rings of concrete were poured at the badly worn slusher drift fingers, but later it was found advantageous to line the slusher drifts and fingers with at least 12 in. of concrete before stoping was started. Reinforcing steel was tried in the fingers and discarded as it formed a line of weakness and the concrete quickly was broken to this line by the pounding and heavy concussion.

Finger design has been changed frequently and many ideas have been tried. The first concreted fingers were tapered, 7 ft wide by 3.5 ft high at the throat, normal to the bottom. The concrete extended 10 ft up the fingers and was formed off in a vertical plane. Usually there were humps in the finger bottoms where the concrete stopped, which tended to cause hang-ups. The finger bottoms, on 45 deg slopes, started at the drift level. The slope of the finger backs was on a 55 deg angle. This difference in slope resulted in a constriction at the slusher drift and made blasting necessary throughout the length of the concrete fingers.

The present unconstricted fingers are driven on 33 1/4-ft centers on both sides of the single-ended slusher drifts, directly opposite each other. They are concreted 8 ft wide, 4.5 ft high and 8 ft long, but the bottoms extend five ft beyond the vertical plane



Stork level represents latest practice in finger raise and slusher drift location and ventilation

of the concreted backs to aid in eliminating hang-ups. The finger bottoms and backs are on a 45 deg slope and most rocks that enter the fingers go through without blasting. The finger bottoms are 18 in. above the floor of the drift, which tends to prevent banking and choking in the fingers. Finger backs are formed in an arch to copy the natural wear. The greatest wear is on the finger backs and an average of five ft of concrete is poured in this section. The amount and thickness of the concrete depends upon the tonnage to be drawn through any finger.

Rock bottoms of the first slusher drifts were badly dug up by the scrapers, which increased power requirements for the hoists. At first eight parallel rows of 60-lb rail were concreted into the slusher drift bottoms to protect them against wear. It was found, however, that the scrapers quickly tore them out. More recently, staggered series of parallel rails, and herringbone rails, with the ends bent down and imbedded in the concrete have been tried. The staggered series of parallel rails are more easily installed and appear to give satisfactory service.

Trouble with Sheaves

Tail sheaves at first were fastened to heavy horizontal timbers or steel beams at the ends of the slusher drifts. These anchors were often bent or pulled out. Then two-ft vertical timber posts with 1 by 12-in. steel bands for holding the tail sheaves were tried. A few of the vertical posts were pulled out or broken but generally the bands and sheaves slid down the posts

and gave no lifting action for the scrapers. Now, heavy H-beams are concreted in the backs at the ends of the slusher drifts. This set-up holds the sheave at proper height for good operation and increases the distance from the back finger to the tail sheave by six ft.

Concrete has solved the problem of ground support in the slusher drifts, although at some increase in cost. In 1939 when concrete was first tried, the slusher drift fingers were in such poor shape that it was impossible to produce the desired tonnage, and without concrete, production demands during the war period could not have been met safely and efficiently. Up to the end of 1948, approximately 94,000 cu yd of concrete had been poured in the mine, mostly in the slusher drifts.

Average compressive strength of the concrete is 4500 psi; therefore, comparatively thin wall sections would be required for support alone. But where it is necessary to withstand the concussion of heavy blasting, double, triple, or even heavier thicknesses, within economical limits, are used. As stated previously, the greatest wear and the heaviest concussion is at the fingers and usually about five ft of concrete is poured at the finger brows. Here, a brow five-six ft thick is usually completely worn out when 40,000 tons have been drawn through the finger.

Concrete Work Mechanized

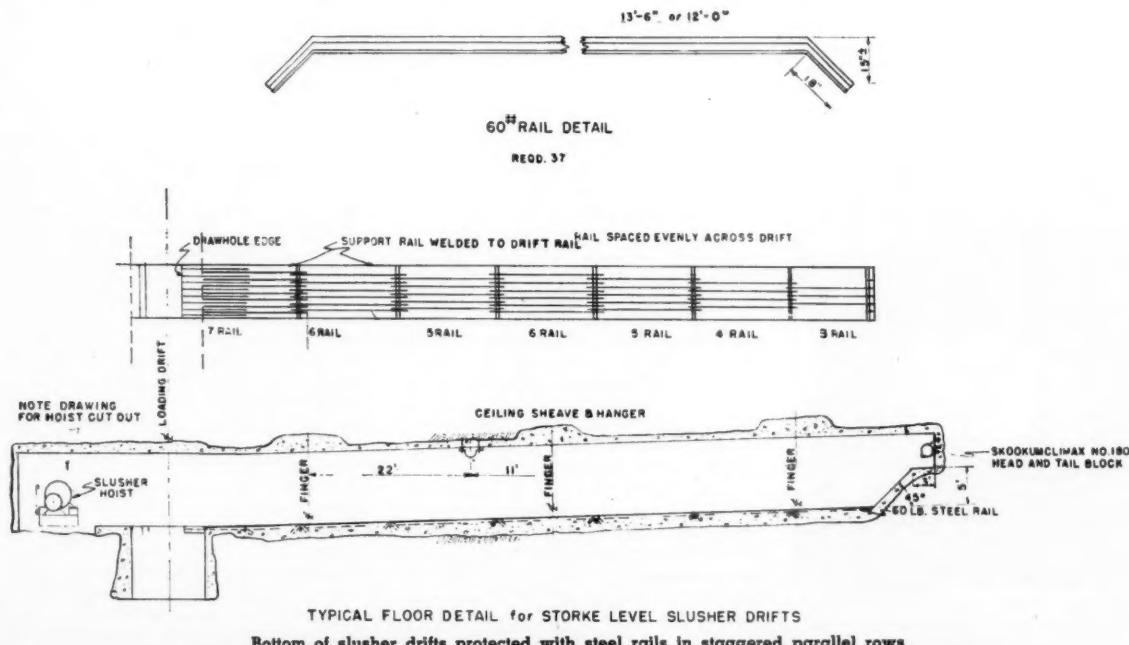
All of the underground concrete work at Climax is mechanized as far as possible. The concrete equipment is all mobile, mounted on 36-in. gauge trucks to fit the Phillipson Level.

track. Sand and gravel are delivered to the mixer in 24-compartment batch cars. Dry aggregate, in weighed amounts, is picked up from an outside bin. The aggregate is fed to the $\frac{1}{2}$ cu yd mixer by means of a conveyor belt mounted under each batch car. Cement is added by hand. The concrete is elevated from the mixer to the pumpcrete machine by conveyor belt and pumped into the forms through a six-in. pipe line. Power is taken from the 275-v dc trolley lines. In the past, when the designs of the slusher drifts and fingers were being changed frequently, timber forms were used; now steel forms have been designed for this work. The steel forms not only eliminate a great deal of waste, but also are erected more quickly and safely.

Stoping Methods Described

Stoping over the Phillipson Level slusher drifts, the footwall slusher drifts and the grizzlies is similar as far as methods are concerned. Efficiency in terms of area undercut per man shift is less for the work done along the footwall or on the grizzly level due to the difficulties in getting men and supplies to the working places.

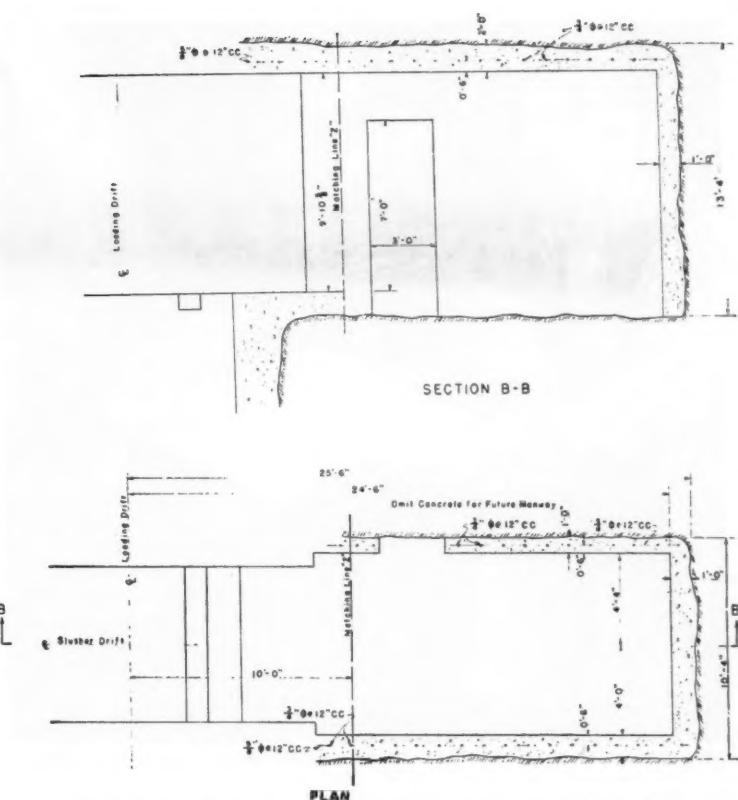
Stoping, in general, consist of driving undercuts from the finger openings in the slusher drifts on a 40 deg slope in a regular manner to form pillars that can be drilled from the undercuts. These pillars are blasted to remove all support from the area to be caved. Along the footwall and in a few other places, cutoff stopes are made on steep angles to aid in the caving action.



Secondary blasting at the slusher drifts and grizzlies makes up the larger portion of all blasting and must be supervised very closely because of the hazardous nature of the work. Forty-five percent semi-gelatin dynamite in 12½-lb bags is used for all secondary blasting to save time and improve cleanup. Three and five ft fuses and No. 6 blasting caps are used to detonate the explosives. Primacord is used to detonate several shots simultaneously with one cap. Fuse blasting is used to avoid danger from stray currents. Electric igniter chambers or pull-wire fuse lighters are used to ignite the fuse.

Five-ft fuses are used in blasting single hang-ups in the fingers. With a multiple shot hooked up with primacord, a cap and three-ft fuse is placed in the circuit in a safe and easily reached position. Paste shots are made on all rocks in the slusher drifts that are too large to load, on large rocks in the fingers that may be reached safely or on rocks in the cars too large to clear the timbers. Rocks hung in fingers of the slusher drifts which cannot be blasted safely by paste shots are reached by means of powder charges tied to the ends of long 1 by 2-in. blasting sticks. An electric igniter is crimped onto a five-ft fuse on any cap that is to be exploded in a finger. The 16-ft or 24-ft shunted leg wires are extended to a safe location in the slusher drift. Thus the shots are placed before the fuse is lit and there is little danger of the explosive being set off even though the hangup comes in. When all is ready, the shunt is removed from the wires and they are contacted on a blasting battery.

A large proportion of hangups in the slusher fingers can be dropped either by working the tight spots with a long pointed blasting stick, or by



Slusher hoist cut-out provides operator with unobstructed view of slusher drift

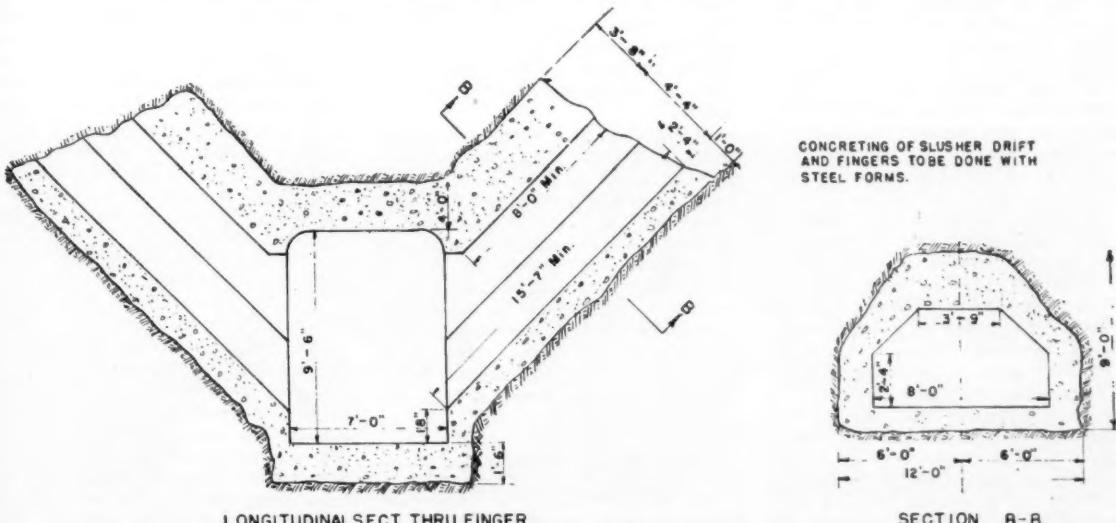
the use of a high pressure water jet. Water is available at each slusher drift at a pressure of 240 psi. High pressure hose and a nozzle make it possible to direct an effective stream of water a long distance up into any finger, without making it necessary for the hangup man to leave the sill of the drift. Before blasting, to bring down a hangup, it is standard practice

at Climax to make every effort to move the wedged ore by means of a bare blasting stick or by the use of high pressure water.

Vary Slusher Hoist Design

Several variations as to size and design of slusher hoists have been employed at Climax. Fifteen-hp, two-

(Continued on page 60)



Finger raises and slusher drifts are concreted for support and to resist abrasion and concussion



New supervisors should be teamed with experienced men for underground training

Supervisory Officials and Labor Relations

THE importance of this subject and the need to dramatize it in correlating mine safety with efficient production of coal and harmony in labor relations need not be emphasized. Good labor relations mean the difference between efficient and inefficient production and more often than not determine whether management problems can be solved with clarity and finality at the lower levels.

Higher echelons of an organization should know what is going on but not be burdened with the details of the small disputes and grievances which occur daily. Their settlement is one of the duties of mine foreman, section foreman and other key men.

Policies differ in a large number of organizations because—mining conditions, financial set-ups, human thinking, experience and other factors vary. Because policies differ the training of supervisors is absolutely essential for a smooth running production machine. The training supervisors get determines in most cases

the kind of company. Will it be a team or a mob? It depends upon the care exercised in nurturing and building morale, knowledge of duties and ability to make instant and correct decisions among the supervisors when necessary.

In this discussion some of the problems confronting mine management and affecting the so-called minor supervisors will be analyzed although a mine foreman who spends thousands of dollars each month in labor and materials is not so minor. A man who is responsible for keeping trouble at a low point and to whom the higher officials look for harmony and efficiency is not minor. He is an important person and is the representative of the company to the employees.

Training Is Needed

No matter where a supervisor comes from or what his experience has been he needs training in the

By C. J. FLIPPEN
Labor Commissioner
Kanawha Coal Operators' Association

Thorough Training and Long Experience Are Needed to Make a Successful Supervisor.

policies of the company he is to work for and the men he is to work with. Many companies, therefore, prefer to train men for promotion rather than hire new men. The financial cost of hiring and breaking in new supervisors is probably more than for other employees. A supervisor, promoted from the ranks, already knows the policies of the company and can be trained quickly.

It is difficult to compute the cost of turnover in supervisors because the cost does not stop with the training of a foreman. Mistakes made and incorrect judgment used because of lack of experience must be forgiven. There are exceptional cases though, where it is better to hire a new supervisor. No company should hesitate to do this when necessary.

Exceptional opportunity to observe the best and worst, along with run-of-mine management in and around coal mines, has suggested that inefficient methods and bad labor relations have a cause just as well as good and efficient management has a cause. Finding the causes of both may not help the organizations involved but it is interesting to observe reactions from both methods, to study the cost, number of accidents and number of grievances presented for settlement.

How is the necessary training for supervisors to be done? Some of it can be done economically by extension night schools, supplemented by more practical training by someone already in the organization. If extension schools are not available it can be done on the job by a member or members of the company personnel. At least some of this training is the responsibility of higher officials. They must be willing to put some personal

effort into the work. This is worth while just as production with minimum cost is worth while, and is a part and parcel of production. All that is necessary to realize the value of this training is to compare the records of companies where supervisors are carefully trained with those who let things take their course.

Numerous troubles and many grievances stem from lack of training of those who have direct charge of the employes in the mine. In fact, at least half or more of the grievances come from situations mishandled by the supervisor, whose lack of training, ignorance of company policy, or insufficient latitude in orders unfit him to handle things correctly.

Safety may seem foreign under this subject but does deserve mention because of the relation of the Safety Code to the working Joint Agreement. Many grievances where the employee did not have much of a case have been bolstered when "Safety" was brought in when the case first started, safety infractions were not mentioned, but later on violations of safety practices as set forth by the Safety Code were brought in to bolster a weak point. By sticking as closely as possible to the provisions of the Safety Code and pursuing safety practices not mentioned, there is less chance of safety being used in a manner not intended when the Contract was signed. Besides, "Safety" is good business. Be entirely honest about securing and maintaining safety in the mines. Sincerity will eliminate a lot of trouble and accidents.

Always Keep Promises

A promise should never be made unless the intention is to carry it out to the letter. Sober thought should be given to this subject for many grievances originate through broken promises, made on the spur of the moment. Even though this may not infringe on the Joint Agreement it is a cause of dissatisfaction and dis-



C. J. Flippin, Labor Commissioner, Kanawha Coal Operators' Association, is especially qualified to speak on the relation of supervisors to good labor relations. The text of a talk he gave before the Pond Creek-Tug River Mining Institute is the basis for this telling analysis of an important topic.

content and will eventually be brought up in the form of a grievance. A promise made hastily and thoughtlessly to get rid of a complaining employee for the moment, will be heard from again.

Some supervisors make promises which they well know they cannot carry out. Some will make a half promise, leaving the employee under the impression that a definite promise has been made. Often this is done because the foreman is a weak sister to start with. At other times he thinks he is trying to get along with his men by compromise, or is afraid of what his superior may say about a grievance coming up. If not sure about what may be caused by a promise or where there is any doubt at all about being able to carry it out, don't make it. A large part of the labor trouble

around mines is brought about by broken promises, causing misunderstandings, distrust, lack of confidence in company officials and management and last but not least, grievances to handle.

Screen New Men

A clear, concise policy on the employment of new men is a prime requisite. Learn the background of each one before he is hired. When companies, which have operated for years without any labor difficulties, let up on employment procedure, trouble starts. A very few rotten eggs can cause a whole organization to tumble in a short time—in fact, one or two percent of the employees can cost a company thousands of dollars in strikes, slowdowns, loss of morale and inefficient work. Satisfied men are usually good producers, and a special effort should be made to hire men who will fit into the organization and cooperate in carrying out company policy. Some mistakes are made even with the best methods of employment available, but they can be held to a minimum by a forward-looking employment procedure intended for hiring good men only.

Modern mining practices require men with a better outlook and personality than in days gone by—men who will work for the interest of the company whether a foreman is looking down their necks or not. The hiring of new employees is not usually the responsibility of minor supervisors but it is they who have the responsibility of working these men after they are hired. There should be close cooperation between the official who actually hires the men and the supervisors who are charged with getting results from them. Why try to train an unwilling and obstinate man when you can get a good one? A man who has caused trouble at other places will probably cause trouble again, unless he was treated unjustly before.

Time will not permit going into all



Capacity to learn and the will to do it are prime requisites for a good supervisor



Extension courses help in training potential supervisors

phases of hiring and placing new men, but generally speaking — be careful, very careful.

Technical Knowledge Needed

Modern mining practices and methods require a high standard in technical skill. During the pick and shovel days very little technical knowledge was necessary. This has changed to the point where machines do most of the work and this requires the men who operate them to be familiar with the technical details of machine operation. When a mining company looks around for a supervisor it naturally expects to get a man who has mastered at least some of the details of modern machine mining and who is interested in learning as much as he can about mechanized operation. The company which doesn't do this is going to pay dearly for the omission. There is no comparison between mining forty years ago and the way it is done at present. Men must adapt themselves to the new order or get out. A supervisor who is not willing to learn new ways of doing things has no place in modern mining.

Higher management is directly responsible for training supervisors technically. Officials must personally see that training is done properly and is kept up. This is an all time job, day by day, month by month, year by year. It is just as much a part of good management as producing coal, for technical training does produce coal in this present age of mining.

No company should expect other companies to train men for it. It is not fair to the company, the employees or the supervisors to depend upon one organization to train men for several neighbors. Failure to accept responsibility by not having a training program means a large turnover in supervisors and this is expensive.

Organization Counts

"Everybody's business is nobody's business." The main responsibility still rests with the top of the company organization and flows toward the bottom. No high official can escape the absolute law, which makes him responsible for, either a smooth running machine, or an inefficient, haphazard one. On the other hand, supervisors must cooperate and work out company policies according to orders from above. These men cannot escape the responsibility of carrying out policies, mine laws, and conforming to the labor contract. Supervisors are not responsible for bad policies, but they should call the attention of the management to mistakes in policy and management which they may think are detrimental to the company. Higher manage-



The supervisor may be called upon to make instant decisions. To the miner he is the company

ment has a duty to listen. Supervisors are not called upon to insist upon a change in policy after focusing attention on what they think is needed.

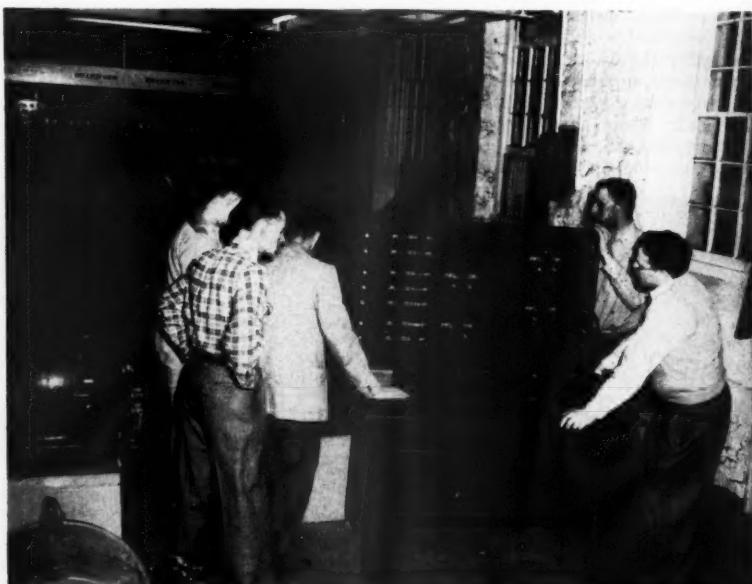
The supervisor's duty is to the individuals composing the organization. Individuals should not be covered up and forgotten by the policies of their leaders. The rights and privileges of each individual should be guarded without injury to the organization as a whole. This is another "must."

Leaders are not born, but are made, provided they have a capacity and a will to learn. Where there is no capacity or no will to learn, leadership is lacking. It may be said that

this is a law of the jungle but it is one of the laws of modern successful business.

Aggressive leadership is not always appreciated, perhaps in some instances because it may be too aggressive, yet it is needed in a live organization to the point determined by those in higher authority. Beyond that point lies danger.

It should be realized that quite a lot of independence has been lost in modern mining methods by the individual. The coal loader of other days used to be his own boss practically all of the time; he is now a member of a crew, or team, and subject to the immediate needs of the



Complexities of modern electrical machinery must be mastered

machine age. Many old fellows could not adapt themselves to working in a crew. They did not care to surrender any of their cherished independence. As a result they found themselves out of step with mechanization.

Too much bossing is possible under present methods. Men should be taught to rely upon themselves. Leadership is needed — not the old type of looking down the man's neck, with the threat of discharge always imminent. A feeling of security should be fostered.

In the modern mine organization a supervisor must be alert at all times, be able to work with his superiors and the men under his charge with a minimum of trouble and grievances. This requires planning and training. Its lack will bring disorganization in the management team. Why do so many grievances and strikes occur, anyway? It is easy to lay all the blame on the other fellow, but some times even he is right. It may pay to look around and see what the other companies are doing—how they handle men and affairs.

Morale Means "Our" Company

What is morale? It is that intangible quality which makes some management teams progress in all phases with very little difficulty. The team members are happy and satisfied, bursting with initiative and ambition and the will to make a good record for the company—"our company." The lack of morale will show in the work of the management team in direct ratio to its absence. This is another instance where a little observation will show us where some organizations have morale and others lack this quality.

Morale is something to be earned. It cannot be purchased, and it can't be dreamed into existence. A good top leader who has the interest of his men at heart and the will to see that his supervisors are trained properly, and inspires his men with vision and a sense of security, a will to carry out policies, a desire to be honest and sincere, a will to work toward successful accomplishment and as a team, with all of the team interested in their work, will bring morale.

Let Foreman Make Decisions

One of the principal causes of poor labor relations is the lack of proper decision on the part of the supervisors when decisions have to be made. This could be caused by several factors, among which are inability to make a decision without prolonged thought and study or insufficient authority to cover situations

that may arise, or fear of making a decision without direct word from a superior.

An employe is entitled to a decision in a reasonable length of time after he requests it. Undue delay may confuse him and cause suspicion of the motives of the supervisor. This sometimes happens when proper authority has not been delegated by the superior to the subordinate. The day of the one man organization is obsolete. Industry has grown too large for one man to make all the decisions except in a general way. It is the executive's business as to whom he delegates authority, but do it he must. A supervisor should have authority broad enough to make instant decisions when they are necessary, as in cases where material damage is about to be done to property, or where trouble is starting. It is not meant that he should give in beyond what is required by the circumstances and the contract. Difficulties come up suddenly at times and the supervisor and his superior should be prepared for such situations before they occur. The complaint is made by higher authority at times that the supervisor isn't capable of making these decisions. All right, train him or get another one. Mistakes are made by the best and if the big boss makes one occasionally the supervisor should be allowed one too, once in a while.

Making decisions on the spur of the moment is a calculated risk in management, but the more training, the more intelligent the supervisor may be, the more familiar with company policies he is, the less risk in letting him make them.

Live Up to Contract

A copy of the joint agreement, a copy of the Mining Laws, and a copy of the Safety Code should be on hand in every mine office. A copy of company safety rules should be posted conspicuously and every mine official should carry a copy in his pocket.

Lately, there appears to be a tendency to work away from the contract instead of working with it. Some seem to think that the contract exists as a starting point for a supplement of things not mentioned to be written into a new one at some future time. This is wrong. The time to negotiate a contract is when this one expires, and meanwhile live up to the present one to the letter. Don't give anything—don't take anything. Difference in interpretation of the provisions of the agreement is an old story. It means just what is written—no more—no less, and trouble is caused when either side tries to read things into it which are not there. Know the contract and follow it.

Good Relations an Asset

Most troublesome aspects of poor labor relations have been mentioned but in my opinion these few cover much ground. Men are creatures of habit, therefore the cultivation of good management habits can assure dependability in labor relations. Such habits will be a source of satisfaction and encouragement toward the time when better relations are the rule.

Good labor relations are a valuable asset and can make or break any organization. Isn't it worth while to cultivate them? At times the work appears discouraging but it is being done to retard and stop difficulties with which the industry is plagued.

One thing to remember is that good labor relations cannot be bought, picked off bushes, or laying around some place for free. They must be earned by hard work and study, planning, thinking, respect for the opinions of our fellows, by being cooperative, and by the evaluation of men through patient study and analysis.

As in safety, good labor relations do not just happen, they are worked for and earned by proper application of the principles of good management.

Development of a good supervisor is a long and patient process for there are many lessons and experiences required for able supervision. Technical details must be mastered, correct personality traits formed, time to assimilate details must be given, policies of the organization learned, leadership developed, prestige of the supervisor developed, discipline learned, teamwork demonstrated, correct attitudes formed. No, a finished supervisor is not the product of a month or two.





Future developments will make present blasting practices seem antiquated

Progress In Blasting Procedure

THE use of explosives in disintegrating formations on the surface, beneath the surface or under water has long been standard practice. Over the years new and improved methods have developed. In the years to come improvements will make today's blasting practices as antiquated as those of 75 years ago. This paper offers a general summary of improvements which have resulted in better blasting procedure. Many local practices which have yielded meritorious results will not be covered because of space limitations.

Improvements in blasting practices are developed in order to improve both safety and efficiency. Complete safety in handling explosives is the aim of the users of explosives though there is no assurance that this utopia can be reached. Safety records of the industry show some extraordinary achievements. Those of the winners of the annual National Safety Council awards show how widespread safety is in the care and handling of explosives. The rules various companies have developed covering their care and use are further indication

Greater Safety and Lowered Unit Costs the Result of Continuous Improvement

By JACK M. EHRHORN
U. S. Smelting Refining & Mining Co.

that safety with explosives is a must in operations. Improved efficiency results from lower explosive consumption, improved fragmentation, cleaner breakage, reduced back-break, reduced throw, reduced vibration and reduced formation of gases. All contribute to lower unit costs.

Progress has been made in blasting procedure along the following lines: safety rules and regulations covering the care and use of explosives, increased use of ammonium nitrate and semi-gelatin powders, packaging of explosives in smaller cartridges for underground use and in larger cartridges for open pit use, primacord with or without spacing, short-period electric delay caps, ignitacord and

connectors, positive spitting devices and stemming.

Extraordinary safety records, compiled by many underground and surface operations, are not the result of chance and luck. Facilities for the storage and handling of explosives and the rules and regulations covering their handling and use are complete and detailed. The success of the safety programs can be attributed in large degree to the strictness by which the programs are administered. Study of successful programs suggests that the important factors in handling, storage and use of explosives are: (1) Minimum number of qualified personnel trusted to usage; (2) insistence on strict ad-

herence to all rules and regulations; (3) observance of the penalties of violations therein; and (4) the elimination of metal contacts especially in electrical blasting.

New Explosives Cheaper

Nitroglycerin has been and still is the basis and it is the standard of comparison of all other explosives on a weight-for-weight basis. Nitroglycerin has a high rate of detonation which produces a quick, shattering effect. No more powerful substitute has been developed to replace it. Its sensitivity prevents its use at full strength. Originally dynamite was made by absorbing nitroglycerin in Kieselguhr, a diatomaceous earth found in Germany. Later sawdust was substituted for Kieselguhr. This resulted in greater strength of explosive because of the gas generated

trate is lighter than nitroglycerin so the resulting mixture occupies more volume than the straight nitroglycerin dynamite. The result is a greatly increased stick count per 50-lb case of explosive. Ammonium nitrate explosive is less expensive than nitroglycerin dynamite.

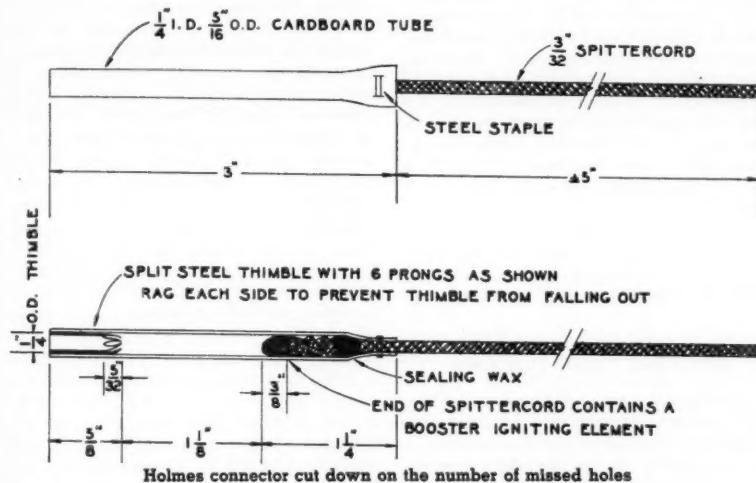
Gelatin dynamites were developed similarly to the straight nitroglycerin dynamites. The former consist essentially of nitroglycerin and nitrocotton with sodium carbonate and wood pulp, or other combustible material. The nitrocotton gelatinizes with the other ingredients forming a cohesive, plastic and dense mass with excellent water resistant properties. Ammonium nitrate has been added to form the semi-gelatine powders so generally accepted during recent years. High-ammonium-nitrate and semi-gelatin dynamites have been

improvement. A good example is the packaging of Nitramon for open pit or quarry use in tin cans of required diameter and length for immediate loading. In underground operations the diameter of holes drilled has been progressively reduced. Twenty years ago practice in many places was to start with 2 1/4-in. diam bits. Subsequently and with the development of detachable bits the starting diameter was reduced to 2 in. Further refinements as represented in the single-use bit resulted in reducing starting diameters to 1 1/4 in. or 1 1/8 in. bits. Gauge changes of 1/16 in. instead of 1/8 in. enabled certain operators to start with smaller diameter bits. Along with the development of detachable bits came the development of smaller sections of drill steel. Quarter-octagon section first in 1 in. and later in 5/8 in. section and hexagonal section first in 1 in. and later in 5/8 in. section replaced round steel in 1 1/4 in. and 1 1/8 in. diam. The reduction in size of steel section allowed further reduction in diameter of hole drilled. The tungsten-carbide insert bits represent a further step in reduction of size of hole drilled. Today some operators have a minimum gauge size of 1 1/8 in. Experiments with 1 1/4 in. gauge as a minimum are now being conducted. Drill and steel manufacturers have performed excellent service in making possible the drilling of smaller holes. The immediate effect of smaller drill-holes was lower powder consumption. In many operations 1 1/4 in. diam cartridges have given way to 1 1/8 or 1 in. diam cartridges. The result is greater stick count per case of dynamite. Present practice of perforating the paper cartridges eliminates the need of cutting before loading. Most operators report lower powder consumption as a result of smaller drill holes. This is a logical result as miners are unable to load a smaller diameter hole as heavily as a larger diameter hole. Many feel that rounds are generally over-drilled and over-loaded. Drilling smaller holes partially reduces these conditions. Savings have been experienced of up to 30 percent of explosive cost as a result of smaller drill holes.

Drill Holes Longer

In both open pit and underground mining operations the length of drill holes has been increased. Primacord is used extensively in both. In open pit blasting primacord has its widest range of application. One or more holes are blasted with one detonation by means of primacord trunk lines. Uniform detonation of blast holes is assured. Fragmentation is generally improved and back-break and throw are reduced. The cost of primacord distributed over the large burden of

HOLMES CONNECTOR



by the combustion of the sawdust. The third step in developing improved dynamite was the addition of sodium nitrate. The combustion of nitroglycerin and sawdust liberated carbon-monoxide. The purpose of sodium nitrate was to act as an oxygen carrier to promote more complete combustion. The fourth step was the addition of ammonium nitrate. This ingredient has the same oxygen carrying characteristics as the sodium nitrate and in addition is an insensitive explosive 70 percent as strong as nitroglycerin. This substitution produced the high ammonium nitrate powders. These are composed of combustible material, sodium nitrate as one oxygen carrier, ammonium nitrate as another and an insensitive explosive ingredient and nitroglycerin as the sensitive and highly explosive ingredient. Ammonium ni-

adopted by most of the mining industry with consequent reductions in blasting costs. The popularity of these explosives is shown by the increased proportion, now 68 percent, that these represent of total explosives production. The reduced sensitivities of these powders is important. The substitution of ammonium nitrate for nitroglycerin has been carried farthest in the Nitramon type of explosives. Here the explosive ingredient is 95 percent ammonium nitrate. The mixture is extremely insensitive and must be detonated by a special primer or TNT, or dynamite.

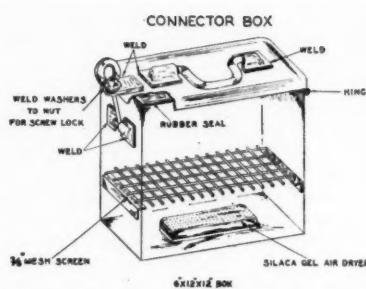
Drill Size Affects Packaging

Packaging of explosives for the purpose for which they are intended, particularly in open pit, quarry and seismograph operations shows im-

hole is a negligible factor. The improvements of the blast more than offset the cost. Average duty for open pit and quarry operations throughout the country is between 4 and 5 tons per pound of explosive. At the Utah Division of Kennecott Copper Corp. the duty during 1949 was 9.85 tons per pound of explosive. In underground operations, where rock conditions permit, a progressively higher ratio of ore is being stoped by long-hole methods. Holes are drilled by diamond drill or by pneumatic drills using sectional-steel and tungsten-carbide insert-bits. Primacord finds an increasing usage in this method of stoping. Where radial drilling leaves a reduced burden at the collar of long holes the powder is spaced or eliminated. Spacing of powder with wood fillers offers both economies and improved blasting. In some cases holes are blasted without primacord with the primer placed at the collar of the hole. Duty per lb of explosive in underground operations varies from 1½ to 2 tons per lb with duties ranging up to 4-5 tons per lb in long hole stoping methods and up to over 7 tons per lb in caving operations. Local practice varies; what may serve one operator may not serve another.

Use More MS Delay Caps

Formerly electric blasting was done only in wet working places or in open pit operations. Today, in addition to blasting under these conditions, electric blasting is in universal use in some operations. Electric blasting caps are improved and are now made with plastic covered lead-wires. Detonation as in the past is by power circuits, blasting machines or batteries. A recent development that suggests interesting possibilities is the short-period or split-second delay. These caps are made in delay multiples of 25-50 milliseconds against the normal electric cap delays of from ½-2 seconds. The use



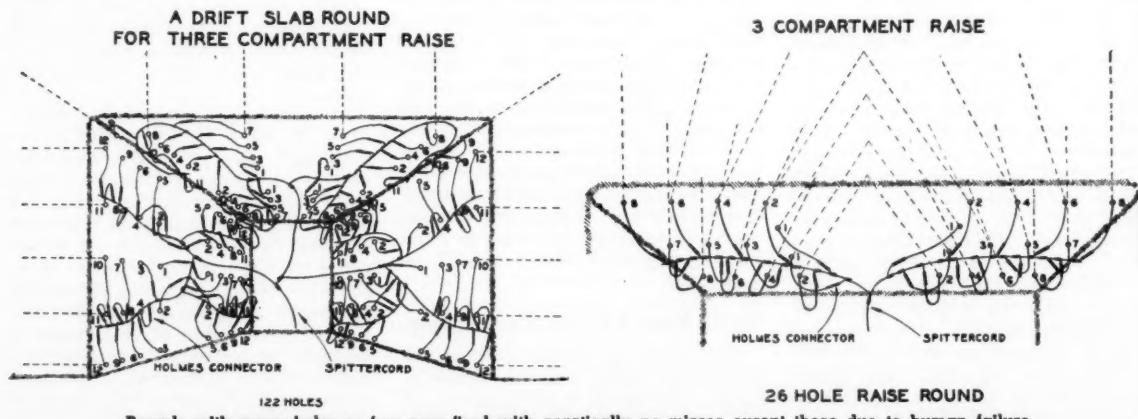
De-humidifier box eliminates faulty connectors due to underground moisture.

of short-period delay electric caps is generally established by local experiments. In some places such as the potash mines at Carlsbad, N. M., they are in regular use. In other places they find limited and special use. Use in long-hole stoping suggests that this field is only partially explored. Short-period delay caps tend to damp seismic shock. Some operators report increased concussion due likely to accelerated air displacement. Some report less powder consumed and less drilling required. Most report increased throw. Some tests indicate that in quarry operations the use of short-period delays results in less noise and vibration, better fragmentation, less backbreak, and less throw, the latter being the reverse of general underground results. Certainly the results that some operators have had suggests that blasting with short-period delays should receive careful attention and experimentation.

Develop Fuse Ignitors

Ignitacord and connectors have been recent innovations in blasting practice. Ignitacord or "spittercord" as it is called in the Western States, has been under development for over ten years. Connectors have been a more recent development and owe their discovery to the use of ignita-

cord. Ignitacord is external-burning as distinguished from the regular fuse which is internal burning. It consists of a central core of iron wire on which is applied a tar-like base which is covered with powder and then wrapped with plofilm. Ignitacord burns at the rate of 18 sec per ft as compared with regular fuse which burns at the rate of 45 sec per ft. The purpose of ignitacord is to act as spitter and timer in normal fuse-blasting. Fuses to the drill holes are first cut the same length and then are split for one in. The split fuse is then wired around the ignitacord. Timing is obtained by spacing the fuse along the ignitacord trunk-line. Recommended spacing of 6 in. is the equivalent of cutting 2 in. or more from the fuse to obtain normal timing. Ignitacord burns through water though if kept in a damp atmosphere it will deteriorate rapidly. At U. S. Section of U. S. and Lark Mine as many as 140 holes have been blasted with fuse using ignitacord with excellent results. One serious objection which led to the development of the connector was experience with ignitacord when only minute quantities of water were present. Missed holes occurred when a minimum amount of water contacted a split fuse. The powder absorbed the water and would not ignite. John Holmes, assistant superintendent at U. S. Section first suggested the device now known as Type C Connector, Ensign Bickford Co., locally it is termed the Holmes connector. The device consists of a paper-covered perforated metal tube in which a booster igniting element is placed, a short piece of ignitacord, a wax seal and a staple. The connector is pushed over the square-cut end of blasting fuse until the end of the fuse butts against the booster igniting element. A general safety practice commonly followed is to paint the ends of fuse when the primers are prepared. The purpose is two-fold: first, to prevent double



cutting of the fuse when establishing the order of firing and second to prevent absorption of moisture. The end of the ignitacord in the connector is attached to the trunk ignitacord-line in proper position to give the timing required.

Connectors with ignitacord trunk-lines have been standard blasting practice at the U. S. and Lark Mine since late 1948 for all blasting except electric. During that time some 474,500 connectors and 434,500 ft of ignitacord have been used. Rounds of 125 holes have been successfully detonated. Occasionally misfires occur but these can generally be traced to human failures though there have been a few failures in manufacture. Miners have no difficulty in acquiring proper technique and after a few uses they prefer to blast by this means.

Ignitacord is used in limited amounts and for special purposes with or without the connectors. The combination offers a means of blasting during electrical storms where state laws prohibit electrical firing during such storms. High and inaccessible points can be blasted by ignitacord instead of long fuse lengths.

Good Effects Outweigh Bad

The use of connectors and ignitacord has had two effects, one favorable and one unfavorable. The favorable factor is safety. By using this method a miner ignites only one point of his round. Greatest improvement is in blasting raise rounds. The lead to the trunk-line is ignited by the miner who is below the raise bulkhead. One of the great dangers in blasting procedure is in igniting rounds. When connectors and ignitacord are used the miner can ignite his round and be away from the face before the fuses are ignited. While there is a limit to how much water can be present and still use this method of blasting, rounds can be blasted when sufficient water is present to be troublesome when blasting with fuse-lighters. To avoid deterioration of ignitacord by moisture we use tightly-sealed metal containers of 500 cu. in. capacity in which one-half lb dessicator of silica-gel is set. Ignitacord and connectors can be kept indefinitely under most severe underground conditions. The unfavorable factor is that of cost. Blasting the average round by this method costs an additional 50 cents. We are willing to accept this added cost because of the greater safety resulting.

Aside from ignitacord other means of igniting fuse consist of hot-wire lighters, lead-wire lighters, pull-wire lighters, Cheesa Sticks and bunch blasting. All these items offer positive lighting and remove the inherent dangers in igniting with carbide light

or notched fuse. The hot-wire and lead-wire igniters can be used as timing devices as well. If used in a length that will burn for a period not to exceed the safe time for the miner to remain at the face and if used with a duplicate lighter, ignited at the same time, the miner is generally well protected. The pull-wire lighter is a device for igniting each fuse. A separate pull-wire lighter must be provided for each fuse. The Cheesa Stick is a development of Imperial Chemical Industries, Ltd., London. The device consists of a hot-burning material mounted on a wooden handle. The substance is timed to burn a specified length and to give notice before going out by changing color. It was developed for use by natives in the Rand gold mines. The device is a fire hazard, otherwise it is as effective as any on the market. Bunch blasting is used in some operations either with bunched fuse or with a master lighter.

Incentive Plans Save Powder

Use of stemming is a practice the value of which is difficult to refute. Stemming refers to the confining of the explosive charge. It is necessary if the explosive charge is to develop its full power and if the amount of poisonous gases evolved is to be kept to a minimum. Sand, clay, loam, mill-tailings are all inert materials that serve well. Paper containers of these materials add a combustible item to the explosive charge. Substitutes for the above-mentioned inert substances are numerous. Many of these have the disadvantage of being combustible. One item of promise because of its inert nature and its cheapness is rock wool. Many mines supply stemming but leave its use to the option of the miner. There is a natural reluctance on the part of miners to use it especially where powder is furnished.

Some operators have realized substantial savings when miners participate in incentive plans which reward them for powder savings. The field of lessee activity has likewise returned the same results. The use of incentives as a means of cutting down powder waste cannot be overlooked. At Birmingham Mines 85 percent of development and 75 percent of stoping are conducted under an incentive plan which allows the contractor a specified amount of powder per unit of measurement. Any savings under the specified amount accrue to the contractor. Powder allowances are determined by a combination of factors based on past experience, and comparisons with similar ground conditions, and most important the results of experimental tests of the duty of powder. Results show that miners

will over-drill and over-load rounds. Over the past four years substantial powder savings have resulted. These savings more than off-set the increased unit costs of explosives.

Other blasting practices, not covered in this article, but which might be mentioned are the use of liquid oxygen as an explosive and the use of shaped charges. The use of liquid oxygen has remained fairly constant. No new developments have been made. The entire output in America is confined to open pit and quarry work. The use of shaped charges offered interesting possibilities after World War II. Since then further experimentation disclosed unfavorable factors. Shaped charges offer a ready means of secondary blasting. As a substitution for the rock drill, costs may be 20 times those of the rock drill.

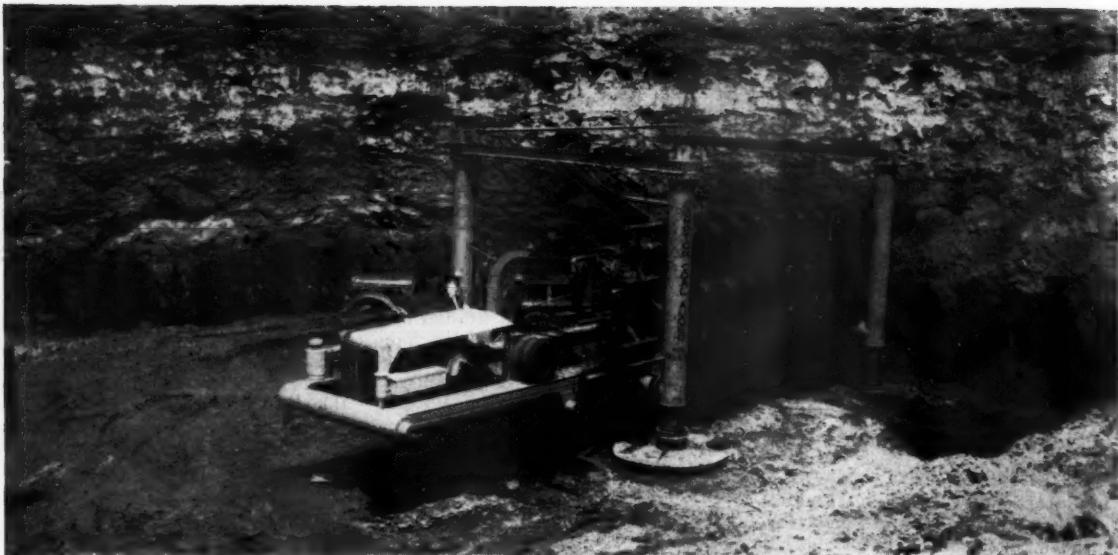
Still Room for Improvement

The past several decades have witnessed notable improvements in blasting procedures. These have produced greater safety and improved efficiency. Future years will bring continued improvements that will lead users of explosives to the utopia where explosives can be made, handled and used without accident. What improvements are likely? The decrease in the size of holes drilled suggests that further reductions are in order and certainly this field will be explored. One limitation is that of the explosive used. Smaller holes will require greater explosive force and to explore this field to the ultimate will demand that chemists find a more powerful substitute for nitroglycerin. The use of compressed air at pressures of 11,000 psi or more is under experiment and may prove of value. Heretofore in the explosive field we have been splitting the molecule. When the techniques of splitting the atom are applied to blasting, our present practice will be outmoded.

The author acknowledges the help and assistance of the many operators and powder experts who assisted him in the compilation and preparation of this article.



**EVERY
MINUTE
COUNTS**



Hydraulic jacks at each corner line auger up with coal seam

THE continuous machine for above-ground coal mining is the coal auger. In the past two years, the use of augers, to recover coal after stripping has reached its economical limit, has become generally known and accepted throughout the industry. In many places coal has been recovered that heretofore probably never would have been mined, especially the barrier pillars between strip workings and old underground workings.

Several established machinery companies have built, and have in operation, augers that are doing a creditable job of recovering coal. Notable among the many are four that were designed and constructed by the Grafton Coal Co. of Clarksburg, W. Va. These are in a class by themselves with regard to size and method of operation. They are large in diameter; high in output, both in tons per day and in tons per man shift; easily operated; and low in maintenance cost.

Experiments in building augers and using them to mine coal was started at the Grafton Coal Co. over three years ago. At that time the company's total production came from stripping the Pittsburgh coal seam. Concern over high stripping costs was the chief factor in directing thought to the possibility of finding some method of recovering immediate coal without resorting to the purchase of heavier stripping equipment. Large diameter augers have been the direct result of this concern.

Last year over 85,000 tons of coal were produced with two augering units. Much has been learned since the construction of the first ones. Many improvements in design have been made which have greatly increased the efficiency of the new machines. Less power is expended per ton of coal

A New Development to Extend Production into the Fringe Area Between Deep and Open Pit Mining

By D. M. BONDURANT

Asst. Prof. Mining Engineering
West Virginia University

and

C. E. COMPTON

President, The Grafton Coal Co.
Clarksburg, West Virginia

produced than was formerly possible, and time losses in operation have been cut almost to nothing.

The latest machine to be constructed is No. 4, a 52-in. diam auger with 280 ft of auger extension. This machine was placed in operation by the Clinchfield Coal Co. at their strip mine near Clarksburg, W. Va., in approximately 104 in. of Pittsburgh seam coal.

Newest Unit for Thick Coal

Machine No. 4 embodies all new ideas and changes suggested by the experience gained in the construction and operation of the first three machines. Nos. 1 and 2 are 60 in. in diameter with three 50 ft auger sections. No. 3 is 42 in. diam with five 28-ft sections. These machines have been kept up to date with additional im-

provements and are still in operation.

The diameter of Machine No. 4 was determined by the fact that it would be drilling in coal 104 in. thick. Because an auger of diameter sufficient to drill full seam height would be impractical, it was designed so that top and bottom holes could be drilled, allowing a few inches for overlapping and clearance of the floor and roof.

The machine consists of three main parts: the frame, augering unit, and the elevating conveyor. The frame is a rigidly welded structure of 18 in. steel tubing. Its function is to give weight against thrust, to provide means for correctly aligning the augering unit, and to provide a proper runway for the augering unit to travel on while the auger is being moved forward into the coal.

The four vertical members at each

corner house hydraulic units having a total lift of 66 in. which allows the drilling of a top hole and bottom hole without overlapping. These hydraulic units are also used to align the auger with the coal seam. The two front jacks operate simultaneously, while the rear jacks operate independently of the front jacks and of each other. The bottom of each jack unit is a steel disc-type pontoon. These provide bearing surfaces for the entire unit. Large hangers attached to the upper part of each vertical member provide storage racks for the auger sections. Four sections can be stored on each side.

The frame, 56½ ft long, is parallel to the center-line and has distance enough for insertion of the 35 ft auger sections into the traversing carriage. It is 14 ft wide and 18 ft high. Steel runways the entire length of the longitudinal members provide the surface on which the augering unit travels. This unit consists of the traversing carriage, a string of auger sections, and the drilling head.

The traversing carriage is essentially a rubber tired power unit which provides the necessary thrust to force the auger and cutting head into the coal, at the same time rotating it to cut the coal, to break it, and to convey it from the hole. Power is supplied by a 300-hp Cummins Diesel capable

of delivering a 30,000-lb thrust while rotating the auger at 45 rpm. A hydraulic motor is used for the traverse reduction feed through a four speed transmission. It is controlled by a variable hydraulic pump, which gives a variable speed of 0-8 fpm in the lowest range and 0-136 fpm in the highest range.

Rubber Tires Give Thrust

Tractive effort or thrust necessary to drive the drilling head forward is developed between the steel runways and four rubber tires mounted in pairs at the front end of the power unit. The thrust needed varies with types of coal and the length of holes being drilled. Since the weight of the augering unit is not sufficient to provide this tractive effort, additional force is obtained by large adjusting screwdowns which load the tires sufficiently to provide the necessary tractive effort. In no case is it necessary to provide thrust greater than that which would move the machine from the coal. The traction tires are of the heavy load capacity type. They travel over steel rods welded across the runway which increase the coefficient of friction between the rubber and steel.

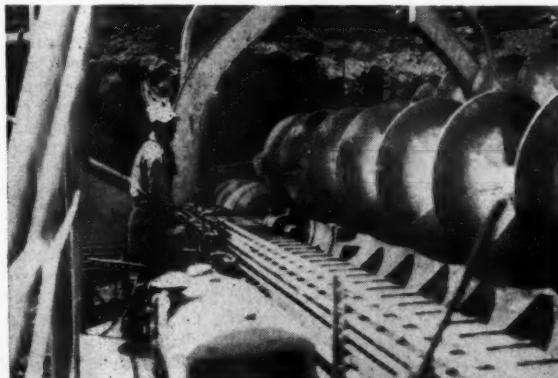
Positive drives such as a rack and pinion were tried in the earlier models but did not prove successful for sev-

eral reasons. The rubber-tired drive provides a cushioning effect in case of shock loading such as that met in drilling into sulphur balls, etc. It also allows slippage should the auger be fed into the coal too fast. The wheels will slip at the predetermined tractive effort, thus preventing motor overload.

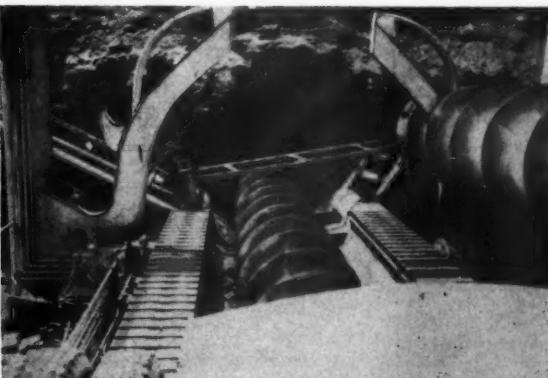
Cone Breaks Coal

The drilling head is a hollow cylinder formed of $\frac{3}{8}$ in. steel plate 52 in. in diam, 6 ft long. Carbide-tipped bits are spaced on the front end of this cylinder and set to cut a $2\frac{1}{2}$ in. kerf around a core of coal. Following the leading edge of the cylinder, a center cutter drills a small hole, and a tapered cone breaks the core by wedging action between the cone and the outside kerf.

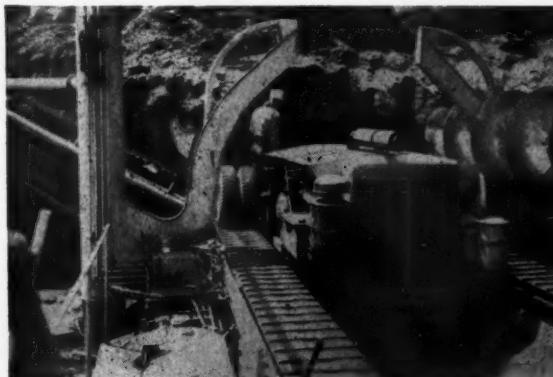
Broken coal is conveyed from the drilling head by the auger to which it is rigidly attached. The auger sections are right hand screw conveyors rotating clockwise, thus discharging the coal to the left side of the hole onto an elevating chain conveyor. The rear end of each auger section carries a 3-arm bearing shoe, which houses double-opposed, self-aligning Timken tapered roller bearings. When the shoes and bearing are moved into the hole the auger is suspended free of the wall and rotates in the bearing without contacting the inside of the hole. The



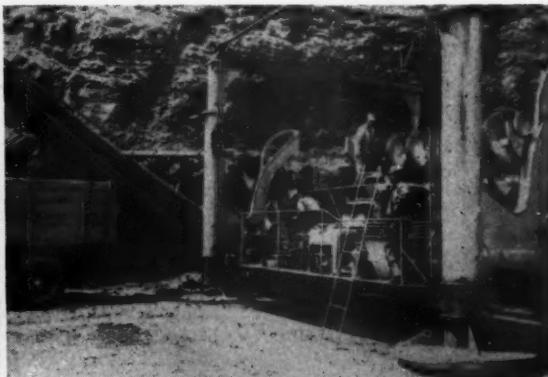
Auger sections are lowered into place by overhead hydraulic hoists



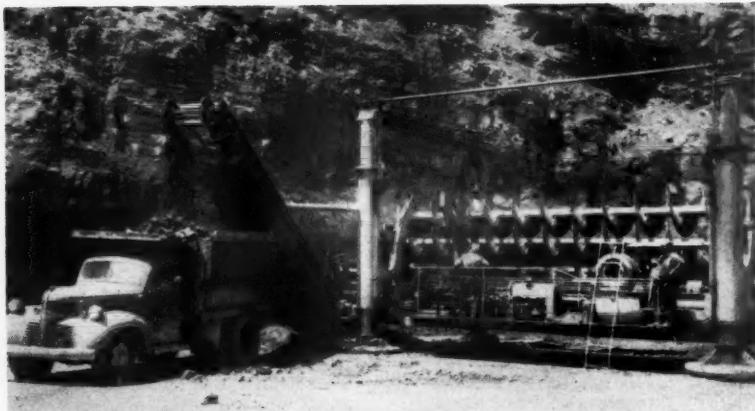
Lead auger and drilling head in drilling position



A rubber tired traction unit supplies the thrust needed



A four-man crew averaged 675-700 tons per shift



Coal discharged from left side of hole is loaded with an elevating conveyor

use of these bearings has greatly increased the efficiency of the drilling process.

Before the application of the bearings to the auger sections, the frictional drag of the auger on the side of the hole was great. This was especially the case when tests were made using very short auger sections. Due to the large number of small sections needed for drilling a hole of fairly long length and to the looseness of the couplings, misalignment resulted. Consequently the holes would "lead off" in the direction of rotation and as a result the frictional drag was much more pronounced than with the longer auger sections.

These long sections are made of heavy material to limit deflection between bearings. Great care has been taken in designing the couplings so that there will be no misalignment.

The couplings are hexagonal shanks and sockets which automatically lock into position by a spring-fed pin. The uncoupling process is also quickly and simply accomplished. In drilling 150-200 ft holes, using long augers with bearing shoes and couplings as mentioned, there is very little "lead off."

The elevating conveyor is an integral part of the unit. It is 36 in. wide with its discharge point a minimum of 12½ ft above the pit floor. The conveyor flights are 6 in. in height, 3 in. of steel with an additional 3 in. of rubber riveted to the steel. This allows the flight to clear the 3-in. clearance between the conveyor pan and the rotating auger and still handle the large lumps. A separate power unit of 50 hp provides power for the conveyor and the hydraulic system used to operate the overhead hoists and levelling jacks. The total weight of the unit is approximately 50 tons.

Auger on Bearings

At the start, the drilling head and the first auger section are set in position for drilling. The machine is aligned with the seam and positioned vertically. If top and bottom holes are to be drilled, the top hole is always drilled first.

The auger is carried forward into the coal until the bearing shoes are seated in the hole. This is done in the lowest speed range of 0.8 fpm at an average speed of four fpm. Each 35-ft extension is drilled to its full length in approximately 9 min. The auger is then uncoupled and the traversing carriage is trammed to the rear of the runway using the highest speed range of 0-136 fpm. Less than a minute is needed to traverse to the rear and insert a new auger section. Additional auger sections are lifted from the racks by overhead hydraulically-operated hoists and dropped into position as needed. Repeated drilling and attaching of the auger sections is continued until the hole is completed.

Upon completion of the hole, the auger sections are withdrawn and replaced in the racks, except for the lead auger and drilling head, which are always left in drilling position. The machine is now lowered to drill the bottom hole or moved to the left to drill the next top hole. The machine is pulled into position for the next hole by a track-mounted tractor. A lot of consideration has been given to the question of making the machine self-propelled by track-mounting it. It is believed that added cost would not warrant this, because of the few moves made in one shift.

At the present six auger sections are being used to drill holes 210 ft long. An average of six holes is being drilled per shift, approximately one hole every hour. With top and bottom holes being drilled it is necessary to make only three moves per shift. During the drilling operation, trucks are continuously being loaded at the discharge end of the elevating conveyor.

Since it is necessary to have a tractor dozer in the pit to clean up ahead of the machine, it can easily be used to move the auger. When the dozer is neither "cleaning up" nor moving the machine, it can be used to build and maintain roads and to backfill behind the machine.

Success Depends on Planning

For best results, augering should immediately follow the stripping operation, as the condition of the highwall is somewhat dependent on the time lag between stripping and augering. Generally the condition of the highway left by the average stripping operator is safe and suitable, if augering is started at once.



A tractor dozer is used to move the auger

Should the highwall be left for any length of time, weathering may affect its condition so that a considerable amount of material may have "sloughed off." Not only would there be added expense for cleaning up, but the highwall might be in an unsafe condition. If the use of augers is anticipated, care should be taken in blasting the overburden of the last stripping cut so as to leave the highwall unshattered and stable.

For most successful operation, auger mining should be a part of the original stripping plan. Of course, auger mining can be successfully employed where this has not been the case. It is thought that even where the pits have been back-filled, it may be economically feasible to remove the fill and recover additional coal with augers. However, such an operation would require careful investigation. If augering has been included in the master plan, the extra cost of preparation for immediate augering is insignificant by comparison to the cost of preparing an old pit.

The Grafton Coal Co. stripping is planned with regard to almost immediate augering of the exposed coal. This requires that a 65 ft level pit, properly drained, be left for operation of the auger. Earlier machines required an 85-ft pit.

Another detail to be considered is the proper time to stop stripping and start augering. Each successive cut becomes more expensive on cost per ton basis when an increasing amount of overburden must be moved; and since the cost per ton of producing coal by augering is decidedly lower than by stripping, the economic limit cannot be determined on a lowest combined cost per ton basis.

Because space must be provided for the operation of the auger, the mini-

mum horizontal distance that should be stripped is approximately 65 ft. In cases where this is not practicable, the spoil could be overcast to provide the necessary distance. If deep mining is planned at a later date, it must be duly considered. Blocks of solid coal of sufficient size should be left at the proper places for entrance to the unmined coal.

High Recovery Possible

The maximum theoretical percentage of recovery is 78.5 percent if the holes are drilled tangent to one another and to the floor and roof of the seam. The percentage drops appreciably as the spacings between holes are widened and as the ratio of seam thickness to auger diameter increases. Therefore it is important to select the maximum auger size that can be used and to determine the minimum pillar size to be left between holes. This naturally would vary with the thickness and character of the coal seam.

With thick seams it becomes impractical to build an auger to drill full seam height. Such a unit would be of tremendous size and weight and would demand a very large source of power for its operation. It is the authors' opinion that the maximum practical diameter is around 60 in. For seams thicker than this it is felt that it would be more practical to use an auger of smaller diameter to drill a number of holes in the seam height. Nothing is sacrificed, percentagewise, in recovery if this is done, provided the same amount of pillar coal is left in place.

With machine No. 4, it is possible to drill within 6 in. of the pavement and 3 in. of the top if the seam is uniform. However, it has been found that after cleaning, the pit floor is

generally 3 in. lower than the bottom of the seam, thus permitting holes to be drilled within 3 in. of the seam floor.

A great advantage in using augers is the ability to mine the seam selectively. Only the salable portions of the seam need be mined. Partings and coal, high in ash and sulphur, can be left in place, thus decreasing transportation and preparation costs. Even in seams of high purity, auger mined coal is considerably lower in ash than strip-mined coal because there is little chance of dilution with the roof and floor material.

Low Labor Cost

At the present time a crew of four men is used to operate the machine. One man operates the traversing carriage and travels back and forth with it. One man operates the auxiliary 50-hp power unit, leveling jacks, overhead hoists, and elevating conveyor. The other two men are helpers who spot the trucks into position and uncouple the augers as they are withdrawn from the hole.

Each 210-ft hole produces approximately 124 tons of coal. Due to overlapping of the holes a shift-average of approximately 675-700 tons is realized. It is apparent that the labor cost per ton is very low.

Auger mining in conjunction with stripping offers the stripping operator a method of increased production at lower cost, at the same time producing a higher quality coal than heretofore possible by stripping alone. Auger mining should be included in the plans before stripping begins for best results and lowest cost. Before investing in heavier stripping equipment careful consideration should be given to the use of large augers to increase production and profits.



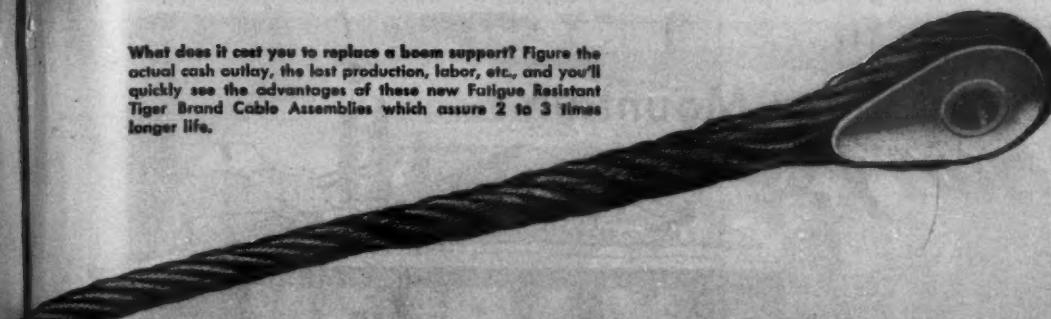
Generally the condition of the highwall left by the average stripping operator is safe and suitable, if augering is started at once.

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Students put classroom lessons to practical test in underground laboratory

Experimental Mine and Quarries

MISSOURI School of Mines and Metallurgy maintains an Experimental Mine and Quarry Plant for instruction in mining practice and for research. This plant is an important complement to the general facilities of the Department of Mining Engineering and is in addition to the ordinary establishment available at Missouri School of Mines as at most other mining schools. It is unique in that it is close enough to the main campus to serve splendidly as a laboratory for daily use throughout the year and, also, its operation is devoted solely to instructional requirements. That is, there is no interruption of work by students because of need to travel major distances to reach the site nor is the ready use of the plant curtailed by the presence of contemporaneous commercial operations.

This paper has been prepared to cite and describe the opportunities such a mine unit affords in the furthering of academic work. For example, the plant, serving as a laboratory, is used for instruction in elementary mining methods, mine surveying, mine ventilation, mine-plant design, etc. The opportunity to present courses of these types during the regular academic year has resulted, it is believed, in better rounded mining curricula and, further, has

Provide Practical Mining Conditions as Scene for Intensive Research

By J. D. FORRESTER

Chairman, Department of Mining Engineering
Missouri School of Mines and Metallurgy

contributed extensively to the development of enterprises in experimental research of mining and quarrying practices.

The mine and quarry property is situated in the wooded foothills lands of the Ozark Plateau. It is about two

miles southwesterly from the main campus of Missouri School of Mines and Metallurgy and is on a track known as the Railroad Addition to the City of Rolla, Phelps County, Mo. The property comprises lots 107 and 112 of section 10, T37N, R8W



Crushed stone quarry No. 1 was the scene of explosives evaluation research project

and includes a total of 21.3 acres. It is entered by means of a secondary road from U. S. Highway 66. The Frisco Railroad right-of-way is the north boundary of the plant property.

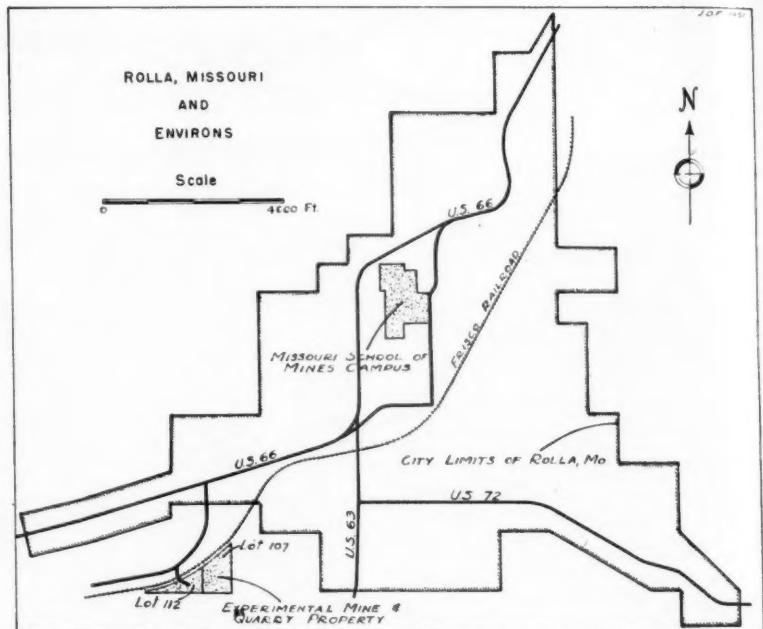
Has Forty-Year History

Mining was begun on lot 112 in 1912 under the supervision of Prof. Carroll R. Forbes of Missouri School of Mines. Since that time, it is estimated that a total of about \$125,000 has been expended in establishing the plant. Early activity was devoted almost entirely to development of the underground workings. A steam engine was the source of power. The dimension stone quarry was opened in 1940 to furnish building stone for construction of Harris Hall on the School of Mines campus and, as a result of research on explosives since 1948, two crushed stone quarries have been developed. The latter quarries have yielded over 30,000 tons of rock, much of which still is stacked in dumps for future disposal.

Complete rehabilitation of the whole plant was begun in 1945 and all buildings now in existence have been constructed since that time. Expenditures during the last six years for machinery renovation and new buildings, that is, costs other than for actual mine and quarry development work, have totaled about \$50,000. Lot 107 (13.3 acres) was purchased in 1949. The plant currently is being operated at an annual over-all cost of about \$3000.

Underground Mine Extensive

The mine and quarries have been opened and extended in a well-bedded, essentially flat-lying dolomitic limestone known as the Quarry Ledge member of the Jefferson City formation (Ordovician). The rock mass, as a whole, is relatively uniform in composition and texture and is not affected by the presence of extensive imposed fractures such as joints and faults. It serves as a good medium



Mine and quarry are reached from the campus in a few minutes

in which research tests and instructional studies can be conducted. The average petrographic composition of the rock is 65 percent dolomite, 20 percent calcite, 10 percent quartz and 5 percent clay, chert, limonite, etc. Its physical properties are:

Specific Gravity	2.73
Porosity	12.73 percent
Compressive Strength	4500 psi
Modulus of Rupture	1000 psi
Impact Toughness	2 $\frac{1}{2}$ cm.
Modulus of Elasticity	3.5×10^6
Modulus of Rigidity	2.5×10^6

The underground mine, extending approximately 1000 ft, has been developed chiefly by means of an adit level and is designed to afford a means of instruction both in room and pillar and selective (drift and crosscut) types of mining. A shaft and two raises hole the surface and a small stope has been excavated. A

concrete collar with steel doors (horizontal) has been installed at the top of each raise and a wooden door, which may be opened to act as a ventilating sail, has been built at the head of the shaft. The raise doors can be opened, during laboratory work, in blasting, ventilation experiments, or surveying.

A sump of 2500 gal capacity for conducting pumping experiments has been established underground and two closed tanks installed to supply water for drilling. One tank is on the surface at the head of the north raise, the other is in the mine and is pressurized by air to give a forced yield. All pipe lines are 2 in. galvanized steel and are interconnected to permit flexible usage and delivery wherever needed. An air receiver of 75 cu ft capacity has been placed in the



Rock broken in underground explosives test is loaded mechanically and size consist determined on surface



mine about 125 ft from the portal.

Trackage in the mine and on the dump is 25 lb steel rail set on 18-in. gauge. Weighing scales and grizzlies are available for sorting at the end of one lobe of the dump. Mucking is done into 1 ton mine cars by a track-mounted Eimco 12-B rocker shovel.

Ventilation is controlled by brattices; a cupola fan being used directly to clear the gases after blasting. Timbering is not required in the mine but several sets of various types have been, and are being, installed for instructional purposes. The mine adit is closed at the portal by means of a steel door.

The crushed stone quarries are so situated on the property as to be "in the clear" when blasting is done. They have been developed on a side-hill slope by benches 10 ft high and serve splendidly for research on explosives and for instruction in quarrying practice. Two-in. air and water lines extend to the quarry sites from the engine house. Minus 4 in., and plus 4 minus 12 in., sorting grizzlies have been installed over bins in such a way that respective quantities of the different sizes of rock yielded from the No. 1 quarry can be measured. This arrangement facilitates the determination of degree of frag-

mentation achieved by a blasting test and, thus, aids in the evaluation of different explosives for quarrying.

Muck is moved from the quarry to the sorting grizzlies or to the dump by using either an International Harvester I-9 front-end loader or a D-6 caterpillar bulldozer.

Surface Plant Complete

The mine and quarry property is furnished with several buildings of major dimension, in addition to the previously cited facilities and equipment.

A list of the more important structures includes:

Engine house, 28 by 28 ft, concrete block.

Well house, 7 by 12 ft, concrete block.

Shop, 17 by 20 ft, concrete block.

Change house, 24 by 25 ft, frame.

Warehouse, 24 by 25 ft, frame.

Explosives storage house, 9 by 9

ft, brick.

Cap storage house, 9 by 9 ft, concrete.

Coal house, 6 by 6 ft, frame.

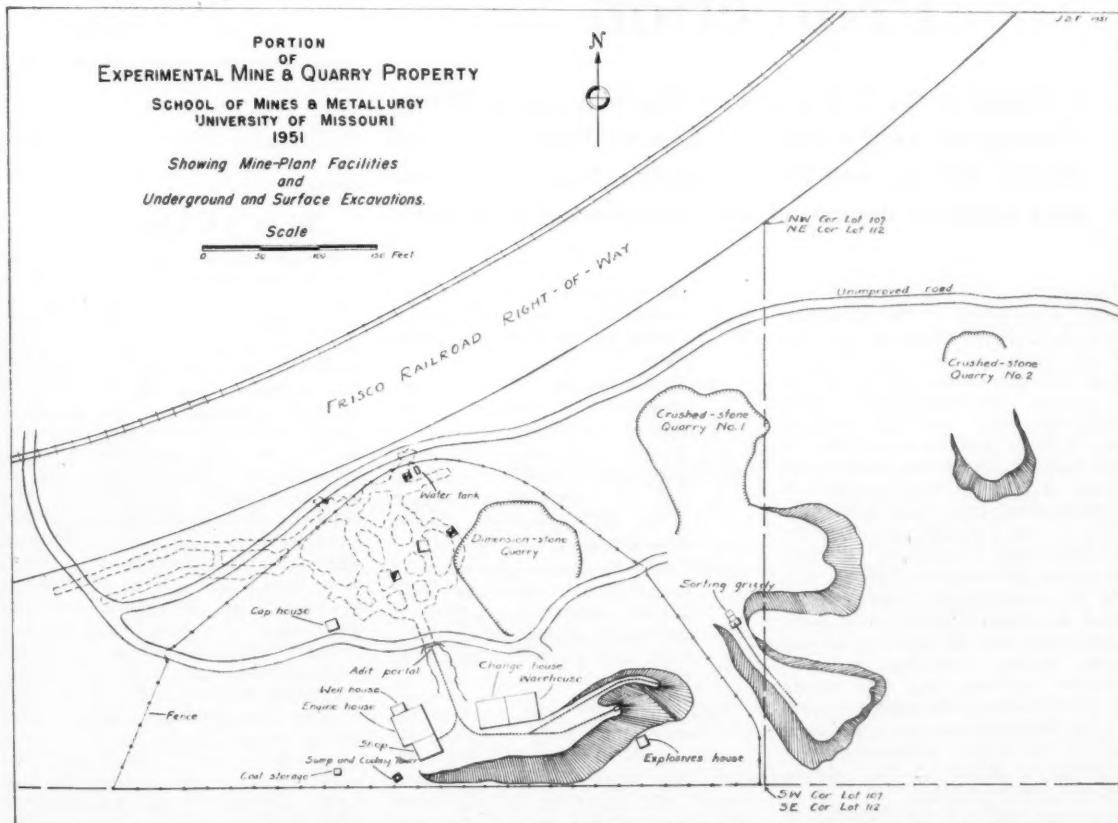
As noted before, all of these buildings have been built since 1945 and are designed and maintained to afford excellent specimens of proper mine-plant construction. For example, the

explosives storage house conveniently will accommodate 70 cases of explosives on well-ventilated racks. Louvered floor and ceiling chambers allow for good air movement through the whole building. A sand-mat six in. thick is in place as a false or second roof under the sheet tin cover which is exposed to the weather. The walls are mortar and brick (two courses) and the door is $\frac{1}{4}$ in. sheet steel suspended to overlap when closed on the brick work on each side. The steel extends beyond the actual doorway space in such a manner as to eliminate direct cracks or openings on the hinge-line, lintel, sill and hasp-line. Other plant structures have been built with similar care and planning.

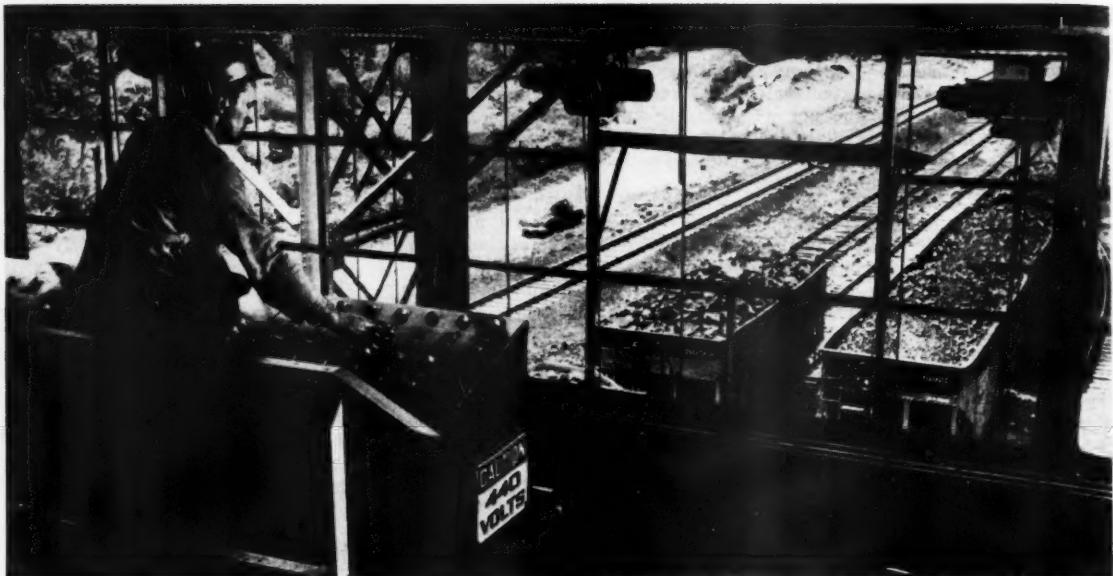
The plant is well-equipped with modern mining devices and apparatus. Major electric power requirements are furnished by a 125 kw marine-type diesel generator located in the engine house. Also, a 5 kw gasoline generator is installed to satisfy minor electrical needs, and a 9 kw dc gasoline generator serves as supplier of such power whenever necessary.

Electricity for the plant is generated on the property for two major

(Continued on page 74)



Complete layout permits full scale experiments under practical working conditions



A-C in common use for surface plants now goes underground

Grounding and Circuit Protection

By the Sub-Committee

C. RAY HUFFMAN

Sub-Committee Chairman

A Report of the Committee on Underground Power, Explaining the Problems of Electric Power for Coal Mining Service and Recommending Measures to Assure Safety to Personnel and Protection of Equipment

IN presenting this report, which represents a consensus of the committee members, it should be stated that it is not the intent of the committee to imply that this is the "last word" on the subject. An underground power installation must take into account many factors and as a number of these factors vary from one mine to another it is not always possible to lay down a set rule which will apply in every case. Recognizing this, the committee has endeavored to make this report as comprehensive as possible in covering the principles involved in circuit protection. Some modification will be required to suit special mining conditions but the committee believes that this report will be of value in helping an operator to analyze his own conditions and provide proper safety measures accordingly. Some of the specific problems are as follows:

- (1) The selection of distribution and utilization voltages on the

basis of safety, economy, and adaptability to underground conditions and mining operations.

- (2) Determination of the sizes, types and manner of insulation of conductors.
- (3) Number, ratings, types, locations and manner of installation of transformers to step down distribution to utilization voltage.
- (4) Grounding and protection of power distribution and utilization circuits for safety to personnel, protection of equipment and flexibility of operation.

This report will be confined to the last named, the others being beyond its scope. No recommendations for protection from excessive voltages caused by lightning or switching surges are included, as this is covered by the report of the Committee on

Underground Power, published in the September 1949 issue of MINING CONGRESS JOURNAL.

Keep A-C Lines Short

In general a-c power for underground mining will be taken from an outside transformer substation, in which the higher voltage at which power is transmitted to the property is stepped down to the mine distribution voltage. This will be 2400 volts or higher, depending on the maximum length of distribution circuits necessary in the particular mine, and upon other factors. These circuits will enter the mine at the portal or in a borehole, carried in cables to all sections where a-c power is to be used and connected to transformers to step down to a lower voltage suitable for the motors and controllers on mining machinery. A-c power at the lower voltages can be carried only comparatively short distances, if the voltage regulation at the motors, from light to peak load conditions, is to be kept within proper limits for a-c motor performance, and if cable sizes and losses are to be kept within practical limits. Accordingly, the transformers must be kept close to the working places, and must be moved frequently

as the workings advance. To facilitate and minimize the time required for such relocations, the underground transformer substations should be of portable construction.

In what follows the circuits of 2400 volts or higher voltage will be termed high-voltage and those of lower voltages, suitable for motors on mining machinery, will be termed low-voltage.

Figure 1 shows schematically the a-c power distribution circuits described by a one-line diagram in which the high-voltage circuit is shown in the form of a main feeder with taps to feeders in butt entries and to portable transformers near the working places. From the transformers the low-voltage circuits are shown to face distribution units and thence to the various motors. No protective devices are shown.

This diagram is not intended to apply to any particular installation, as the arrangement of the circuits and the number of high and low-voltage feeders will vary in different mines. In general, however, it is to be expected that a number of high and low-voltage branch feeders will be required to supply separate working areas.

Ground Faults Dangerous

Unless adequate protection is provided, in distribution circuits such as those described, carried into portable junction and transformer units, and into portable mining machines, which cannot be adequately grounded, there exists the hazard of a dangerous voltage appearing between the frame of a portable unit and ground, if ground faults should occur on different phase wires and one of these faults is to the frame of a portable unit.

Figure 2 illustrates this condition by the schematic diagram which shows three phase wires A, B and C from a transformer through a circuit breaker and into a portable unit. Ground faults are indicated on wire A at X1 and on wire C at X2, the latter to a portable unit.

If fault X1 occurs first, the effect will be to put wire A at ground potential and wires B and C at full line-to-line voltage above ground. There will be no interruption of service, and the system may operate indefinitely with the existence of the ground fault unknown. This is a dangerous condition.

A second ground fault on another wire, such as X2 on wire C, produces a short circuit, in which the amount of fault current will depend upon the impedance of the circuit, including the impedances of the two faults. If one of these faults is to the frame of a portable unit, as indicated at X2, the fault current will flow through

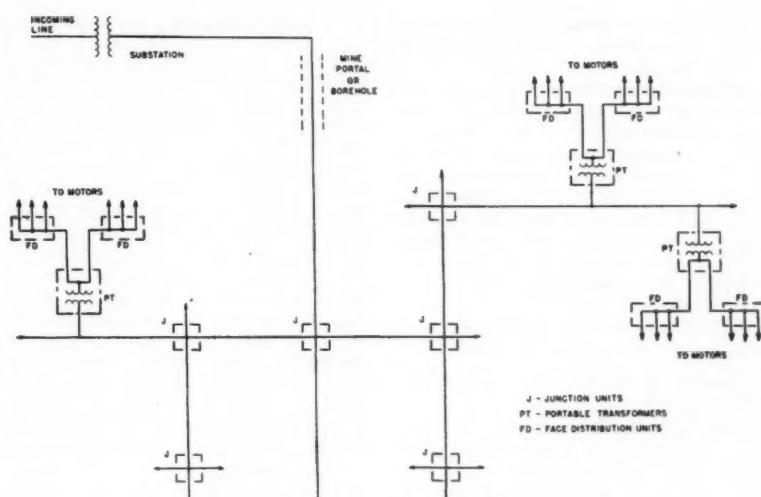


Fig. 1—Schematic diagram of mine power distribution circuits

the contact of this unit with ground and to the other ground, somewhat as indicated by the broken line.

The line-to-line voltage impressed on this fault circuit will be divided in proportion to the impedance of the different elements which are in series in the circuit, and if the contact resistance between the portable unit and ground should be high, a large part of the line voltage may appear across this contact. If a person should be standing on the ground and touching the portable unit at the time such ground faults occur, he may receive a severe or a fatal shock.

If the total impedance of the fault

circuit is low, the current may be large enough to cause the usual overcurrent trips to open the circuit breaker. However, during the interval of time necessary for such devices to function, a person in contact with a portable unit may receive a dangerous voltage. If the impedance is high, the fault current may not be large enough to actuate the overcurrent trips, and high voltage may be present between the frame of the portable unit and ground as long as the circuit remains uncleared.

A high degree of protection against this hazard may be secured by:

(a) Providing a connection of the

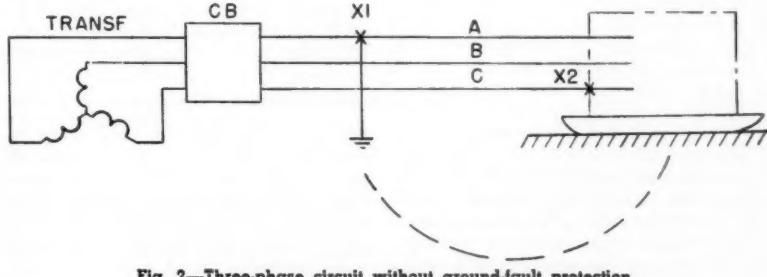


Fig. 2—Three-phase circuit without ground-fault protection

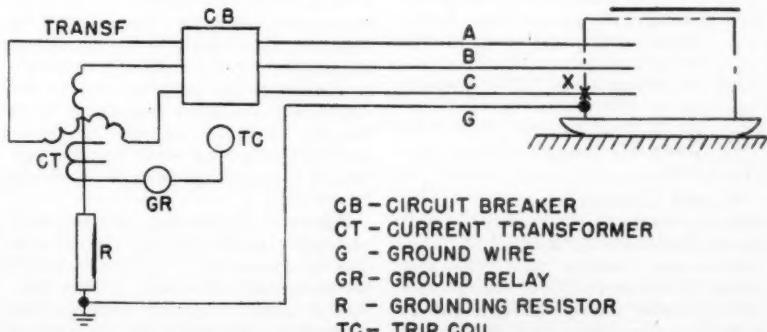


Fig. 3—Three-phase circuit with ground protection

lowest practicable impedance between the frames of all portable units and ground.

- (b) Limiting the ground fault current to such a value that the potential rise of the frame of a portable unit above ground, approximately equal to the voltage drop in the impedance of the grounding connection, will not exceed a voltage which ordinarily is not considered dangerous to human life.
- (c) Disconnecting the faulted circuit as quickly as possible.

Figure 3 shows such protection schematically in which:

- (a) The portable frame is connected by a fourth wire in the distribution circuit to a permanent low-resistance ground at the substation.
- (b) The substation ground and

Limit Fault Current

With a ground wire of a given resistance, the smaller the maximum ground fault current that is permitted to flow, the lower will be the voltage drop in the ground wire and the voltage rise above ground of a portable unit connected to the ground wire. From this viewpoint it would seem desirable to limit the ground fault current to a value of only a few amperes. However, because of static unbalance or leakage, in some cases there may be currents of this order of magnitude in the ground connection, even though there is no actual fault in the circuit. Also, it is necessary that the circuit be cleared if a high-impedance fault should be present, holding the fault current to a value much lower than the maximum determined by the grounding resistor. Probably it is a safe assumption that the current into the

former is connected to obtain a neutral point for grounding the circuit as described. If the transformer secondary windings are wye-connected, of course, the neutral point of these windings can be grounded, and the separate grounding transformer is not needed.

Figure 4 shows the ground wire connected to the protective ground at the substation, extending continuously throughout the distribution circuits and connected to the frames of all portable units.

In the junction unit indicated in the high-voltage circuits a circuit breaker with ground-fault and overcurrent trip is shown in each of the three branch feeder circuits, providing for clearing any circuit on which a fault occurs without interrupting the other circuits. The relays used in such units should be adjustable for

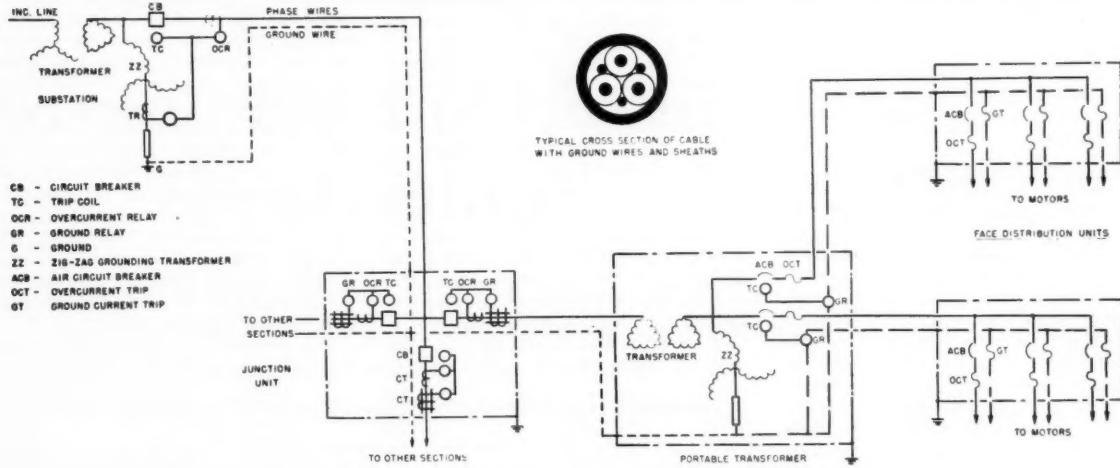


Fig. 4—Protective elements for a-c power distribution circuits

ground wire are connected to the transformer neutral through a resistor (R) to limit the maximum ground fault current to a comparatively low value, such that the voltage drop in the ground wire with the maximum fault current flowing, and the corresponding voltage of the portable frame above ground potential, will be held to a low value.

- (c) A ground relay (GR) connected to trip the circuit breaker on flow of ground fault currents into the transformer neutral.

In such an arrangement, if the resistance of the ground wire is small by comparison with that of the current-limiting resistor and other elements of the circuit, the voltage rise of a portable frame, in the event of a fault to the frame, will be held to a correspondingly low value.

system neutral will be well within 5 amperes without an actual ground fault present on circuits such as those under consideration, the greater part of which will be in cables. Accordingly, with relays having a tripping range of the order of 4 to 1, and the resistor designed to limit the maximum ground fault current to 25 amperes, the relay may be adjusted to trip on fault currents in the range of approximately 6 to 25 amperes. If preferred, the resistor may be designed for a higher maximum fault current up to 50 amperes, in which case the tripping can be obtained over a range down to approximately 12 amperes.

Figure 4 shows such ground-fault protective equipment at the substation by the one-line diagram, in which the secondary windings of the substation transformer are shown delta-connected (commonly the connection for 2400 volts) and a zigzag trans-

former is connected to obtain a neutral point for grounding the circuit as described. If the transformer secondary windings are wye-connected, of course, the neutral point of these windings can be grounded, and the separate grounding transformer is not needed.

Figure 4 shows the ground wire connected to the protective ground at the substation, extending continuously throughout the distribution circuits and connected to the frames of all portable units.

In the junction unit indicated in the high-voltage circuits a circuit breaker with ground-fault and overcurrent trip is shown in each of the three branch feeder circuits, providing for clearing any circuit on which a fault occurs without interrupting the other circuits. The relays used in such units should be adjustable for

no flux in the core and no current in the secondary winding, but with a ground fault on one wire and increased current in this wire, the balance will be upset and the ground relay will be energized. The same effect may be obtained with three individual current transformers connected in Y with the ground relay in the neutral connection.

The one-line diagram, Figure 4, indicates such current transformers in the junction unit by showing the three-phase wires through each transformer connected to a ground relay.

The diagram shows one high-voltage feeder carried to a portable transformer unit for stepping down the voltage to a value suitable for distribution to the working area and for the motors and controllers on mining machines. The secondary windings of these transformers are shown delta-connected, with a zig-zag grounding transformer added to obtain a neutral point for grounding the low-voltage circuits. Because of the comparatively short lengths of the low-voltage circuits and the fact that they are entirely in cables, the grounding resistor in these circuits can be designed to hold the maximum ground fault current to a value much lower than desirable in the high-voltage circuits, and 5 amperes is considered a suitable value.

If the transformers in the portable transformer units are wye-connected on the low-voltage circuit, the neutral point of these windings may be grounded through the current-limiting resistor, and the separate zig-zag grounding transformer will not be needed.

Avoid Y-Y Transformers

It should be noted that Y-Y connected transformers may cause interference in any telephone circuits which are near the distribution circuit, and therefore should be avoided if such telephone circuits will be present.

Two separate low-voltage feeders are shown from the portable transformer unit, and an air circuit breaker with overcurrent and ground fault protection in each feeder. At the end of each of the two low-voltage feeders a face distribution unit is shown, and air circuit breakers with overcurrent and ground-current trips for selective tripping of separate feeders to individual motors or machines. Relays connected in the ground wires and to shunt trip coils on the breakers may be used if preferred to the ground current trip coils indicated on the diagram. In order to obtain selective tripping of separate motor or machine feeders in the event of ground fault, the back-up protection in the portable transformer unit should have in each low-voltage

feeder to a face distribution unit a ground relay providing a short time delay, protecting against ground faults in the circuit between the two units and permitting a ground fault on an individual motor or machine feeder to be cleared by the instantaneous ground trip on the breaker in the face distribution unit.

A high degree of protection against the hazard of a dangerous voltage appearing between the frame of a portable unit or machine and ground will be provided by the protective scheme described. It is essential that the ground wires be carried continuously throughout all circuits and connected to the frames of all portable units or machines to be protected.

If simultaneous ground faults should occur on different phases, the fault current will not be limited by the neutral grounding resistor, and if one of these faults should be to the frame of a portable unit a dangerous voltage between this frame and ground may be produced. It is important, therefore, that the protective apparatus be designed and maintained to clear immediately the circuit on which the first ground fault occurs, with short time delay on back-up protective equipment only as required to obtain selective tripping.

Air Breakers Protect Cables

For protection against line-to-line faults, circuit breakers of adequate current carrying capacity and interrupting rating should be used in all circuits in which selective overcurrent or ground-fault protection is required. If ground-fault or selective overcurrent protection is not required on any individual feeder, fuses of adequate rating may be applied for overcurrent protection.

Air circuit breakers with thermal and instantaneous magnetic trips are well adapted to protection of cables, starters, and motors under short-circuit conditions, and such breakers may be equipped with ground-current trips or with shunt trips for connection to ground-fault protective relays.

Recommendations Suggested

The substation transformer secondary windings preferably should be wye-connected to provide a neutral point for grounding. If delta-connected, a zig-zag grounding transformer should be installed to provide a neutral point.

Install a permanent protective ground at the substation, of 5 ohms or less resistance.

Connect the protective ground to a ground wire extended throughout the high and low-voltage distribution circuits and connected to the frames of all portable junction boxes, transformer units, face units and machines on these circuits. This ground wire

should be kept continuous between the frame of any portable unit and the protective ground at the substation, and the resistance should be as low as practicable, preferably not more than 2 ohms. Frequent testing of the ground wires for continuity and resistance is recommended.

In making ground connections between units, special precautions should be taken in running the ground wire from the ground relay in the portable transformer and face distribution boxes. The wire from the ground relay to the face distribution box must be insulated from ground at the portable transformer and all the way to the distribution box to avoid shorting out the ground relay.

Should a-c and d-c systems be in service in the same mine area, the a-c grounds should be isolated from the d-c grounded conductor in order to prevent harmful d-c currents from flowing in the a-c ground wires.

The protective substation ground preferably should be separate from the ground to which lightning arresters and the substation structure are connected, so that the voltage of the distribution circuit ground wires and the frames of portable units connected to these wires will not be raised above ground by lightning discharges or flashover of insulation in the substation.

Connect a current-limiting resistor between the protective ground and the neutral point of the high-voltage distribution circuits, designed to limit the maximum ground-fault current to 25 amperes (or if preferred to 50 amperes) in case of a single line-to-ground fault. With a given resistance in the ground wires from a portable unit to the substation, the lower value of maximum ground-fault current will hold the voltage rise of a portable unit above ground to a lower value.

Install between the grounding resistor and the neutral point a current transformer and an inverse-time ground protective relay, connected to trip a circuit breaker in the high-voltage distribution circuits on flow of ground-fault currents. If more than one high-voltage feeder is taken from the substation, and if selective tripping of separate feeders on ground faults is required, a circuit breaker with current transformer and ground protective relay should be installed in each feeder.

Additional current transformers and inverse-time overcurrent relays should be installed at the substation to provide selective tripping of the circuit breakers, as required, on line-to-line faults.

At each location in the high-voltage distribution circuits where branch feeders are to be connected, a circuit

(Continued on page 67)

Recover Tin, Tungsten and other high Specific Gravity minerals in —200 mesh range at low cost with—

DENVER
BUCKMAN

→ Tilting Concentrator

Hochschild
Colquiri Plant
in
Bolivia

recovered 15 tons
per month at a cost
of only 7c per ton milled

(Quoted from November 1950 Mining Engineering)

"The tests reported in this paper indicated a tin recovery of 42 pct. The actual plant results for 1949 show a 54 pct. tin recovery from the Sullivan (Denver-Buckman) decks.

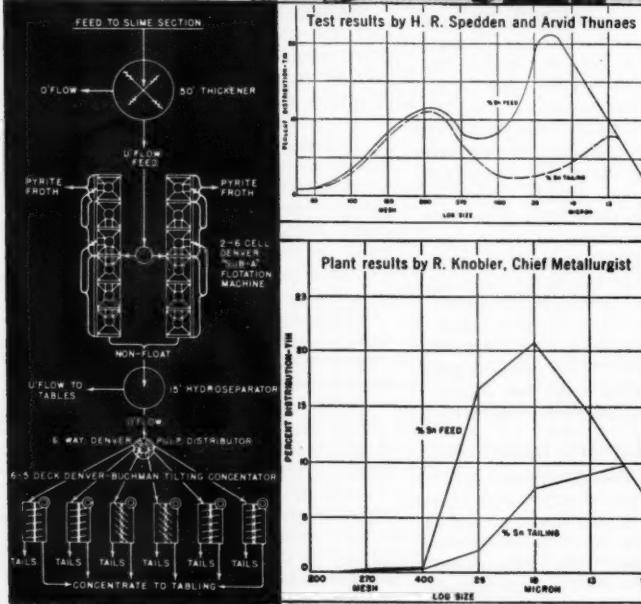
"The total average quantity of tin produced from the S deck section in 1949 was 15 tons of tin per month. This corresponds to 3 pct. of the total mill recovery.

"The operation of the whole slime plant in Colquiri including flotation and fine sand tailing, cost \$0.07 per ton milled.

"In the year 1949 only \$317.00 was spent for spare parts and material for the Sullivan decks in Colquiri with a total of 268,600 tons milled."

Because of its ease of operation, The Denver-Buckman Tilting Concentrator is far superior to any known type of machine for recovery of cassiterite and other high specific gravity materials in fine sizes.

Denver-Buckman Concentrators are available in half sizes for laboratory pilot plant work, or the testing can be done by Denver Equipment Company Ore Testing Division on a cost basis.



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With the Defense Agencies

THE Korean "cease fire" situation has brought out a rash of statements by key defense officials calling for no letdown in defense production and mobilization of our armed might. They indicate that the full impact of the industrial program is to be felt in the months ahead and that continued economic controls will be necessary to harness inflation.

The first step in "removing the bugs" from the overall defense production organization was taken by Mobilization Director Charles E. Wilson when he named Manly Fleischmann to head the Defense Production Administration. Fleischmann also remains administrator of the National Production Authority and is expected to weld the two agencies into a smoothly functioning team. Wilson is known to be studying other improvements in the defense set-up, and more reshuffling of agencies and functions is anticipated shortly. His close advisors have been casting their eyes over the multiplicity of agencies dealing with the minerals program.

Wages and Prices

Efforts to shape up a national wage policy thus far have resulted in no decisive action. Economic Stabilizer Eric Johnston has indicated that the Wage Stabilization Board might approve a general wage increase formula, under which hikes in pay could be made based on increases in the cost of living, gains in productivity, and in hardship cases. To date, however, this proposal, which would permit advances from 10 percent above January, 1950, levels to 13.5 percent above those levels, has not been approved by the Board.

Johnston has named Dr. Raymond B. Allen, president of the University of Washington, as chairman of the newly-created Salary Stabilization Board, which will handle wage in-

creases for executive, administrative, professional and other salaried employees not represented by labor unions. Others appointed to the Board are: Ellsworth C. Alvord, tax counsel of Washington, D. C.; C. S. Golden, Harvard School of Business Administration; C. P. McCormick, president, Charles P. McCormick, Inc.; and V. Henry Rothschild, II, New York corporation lawyer.

On the pricing front, the Office of Price Stabilization received a jolt when Congress, in extending the present Defense Production Act through the month of July, banned price rollbacks during that period. As a result of the Congressional mandate, OPS issued a "general overriding regulation" extending indefinitely the dates for filing ceiling prices under the terms of six pricing regulations which were due to take effect during July and August. At the same time the agency ordered manufacturers to observe, for an indefinite period, the price ceilings under which they were operating on June 30. The six regulations all involved manufactured commodities, ranging from machinery to wearing apparel. Under these regulations, manufacturers would have applied the "pre-Korea plus" pricing formula to their products resulting in some price increases and some decreases. Those manufacturers who have already established new ceiling prices under these orders—such as might have occurred under Ceiling Price Regulation 30 which covered mining equipment manufacturers—will be required to keep them in effect, while those who have not set new ceilings will continue to price their products under the General Ceiling Price Regulation.

Just prior to issuance of the overriding regulation, OPS had amended its manufacturers general pricing regulation (CPR-22), and its machinery pricing regulation (CPR-30) to

provide optional methods of figuring materials costs and to permit labor cost determinations to reflect unemployment insurance payments. The OPS amendments banned the inclusion in labor cost adjustments of retroactive wage increases or fringe benefits granted after March 15. The amendments also defined the term "all non-metallic minerals" to mean those "which are obtained from their natural state solely by mechanical means such as grinding, washing, leaching, classification, flotation, evaporation, dehydration and the like. This term does not include commodities which are obtained by refining or purification processes involving recrystallization or chemical methods including carbonation, ionic interchange and similar methods."

Controlled Materials Plan

The "open-end" Controlled Materials Plan went into effect on July 1, with all indications pointing to the possibility that it may become a complete CMP before the end of the year. NPA Administrator Fleischmann announced a time table for operation of CMP in the third quarter, and in so doing indicated that materials demands may increase to the point where it will be necessary to extend the CMP for copper, steel and aluminum to a full-fledged control plan. He said that all producers of defense-supporting and essential civilian products, who filed under CMP regulations, would receive allotments of the three metals for the third quarter in ample time to obtain materials for September production. He also stated that "certain quantities" of the metals would be ordered held in reserve to supply needs of the consumer durable goods industries operating in the "free area" of the present open-ended program. He added that consumer durable goods producers may be asked

(Continued on page 77)



One of the soundest purchases any mine can make ... BETHLEHEM PREFABRICATED TRACK

Bethlehem furnishes everything in prefabricated mine track—rails, turnouts, steel ties, switch stands, braces, and all other components. This makes it possible for the mine owner to install a completely integrated layout, one in which every part works in harmony with all the rest.

When Bethlehem supplies the whole system, there are no makeshift items, no odds and ends to cause trouble. There's no struggling with substitute or "home-made" parts, which often mean a dangerously loose track structure. All elements of Bethlehem track are designed to fit easily into their proper places; joints are snug, braces and frogs and guard rails tight. Your layout therefore requires less maintenance; you have properly-aligned track right up to the working face, and you can safely run your trips at higher speeds.

Economy? Well, as a sample, consider one tremendous factor—installation costs. Many mines that for years cut and bent their own rails have now found the

practice much too expensive, and needless as well. Today they're making big savings with Bethlehem prefabricated track, which comes to the purchaser with all rails *cut to proper lengths and curved to the proper radii*. This feature alone has meant outstanding reductions in track-laying time.

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Wheels of GOVERNMENT



As Viewed by A. W. DICKINSON of the American Mining Congress

FAILING in their endeavor to push through to enactment by June 30 the proposed revision of the Defense Production Act, Administration leaders have put through an extension of the current Act to give the Congress time to complete its work on the amended bill. This decision was forced by the addition of 57 committee amendments to the House bill, each one of them calling for separate floor votes.

Meanwhile House Foreign Affairs Committee hearings have just begun on the Administration's \$8.5 billion foreign aid program, which calls for \$6.3 billion in arms aid and \$2.2 billion in economic and technical assistance—largely for our European allies.

The Senate Majority Party Conference has voted to remain in session until final action is taken on the extension of the Defense Production Act, the foreign aid program, departmental appropriations bills and the Revenue Bill of 1951. According to Senate Majority Leader McFarland of Arizona it is now apparent that no recess can be taken until the end of September or the first of October.

Taxation

The Senate Committee on Finance is proceeding with its consideration of the Revenue Bill of 1951, following House approval of the \$7.2 billion measure on June 22 by a vote of 233 to 160. A previous vote to recommit by Representative Reed (Rep., N. Y.) was rejected by a vote of 220 to 171. As received by the Senate, the bill would increase personal income tax liability by 12½ percent, effective September 1, 1951. It would raise the corporate tax rate by 5 percentage points retroactive to January 1, 1951; increase the corporate over-all tax ceiling 8 percentage points from 62 to 70 percent; raise the ceiling on the amount of income taxes that can be taken out of an individual's income from 87 percent to 90 percent; and increase the effective rate of capital gains tax for individuals and corporations from 25 to 28.1 percent, effective September 1, 1951.

In addition to increasing the percentage depletion allowance for coal from 5 percent to 10 percent, while leaving metals, sulphur and other non-metallics undisturbed, the bill extends percentage depletion to borax, Fuller's earth, refractory and fire clay, quartzite, perlite, diatomaceous earth, metallurgical and chemical grade limestone, and tripoli at a rate of 15 percent; and to asbestos, sand, gravel, granite, marble, stone including pumice, scoria and slate, brick and tile clay, shale and shell at a rate of 5 percent.

In acting on the expensing of development costs, the Ways and Means Committee amended Section 23 of the Internal Revenue Code, relating to the deduction from gross income, by adding a new subparagraph "(D)" which reads as follows:

(D) DEVELOPMENT OF MINES.—Expenditures paid or incurred after December 31, 1950, in the development of a mine or other natural deposit (other than an oil or gas well), to the extent paid or incurred after the existence of ores or minerals in commercially marketable quantities has been disclosed, shall be deductible, on a ratable basis, as the units of produced ores or minerals benefitted by such expenditures are sold. Such expenditures, and the adjustments to basis provided in Section 113 (b) (1) (J), shall not be taken into account in determining the adjusted basis of the property for the purpose of computing depletion under Section 114. This subparagraph shall not apply to expenditures for the acquisition or improvement of property of a character which is subject to the allowance or depreciation provided in Section 23 (1). For purposes of this subparagraph, allowances for depreciation shall be considered as expenditures."

In its report on this very important amendment the Committee on Ways and Means stated:

"Section 302 of this bill changes the treatment of development expenditures in the case of mines and other natural deposits except oil and gas



Washington Highlights

CONGRESS: No recess 'till mid-September.

TAX: Senate opens hearings.

SOCIAL SECURITY: Unemployment compensation hearings July 18.

TRADE AGREEMENTS: Extension law enacted.

DEFENSE ACT: Both Houses debate.

FREIGHT INCREASE: Coal industry protests.

ASSESSMENT WORK: Would change to November 1.



wells. Under existing law and regulations all such expenditures in excess of net receipts from minerals sold are charged to capital account so long as the mine is in the development stage. When the mine has passed into the production stage such expenditures are deductible in the year in which the ore or mineral benefiting from such expenditures is sold. The transition from the development to the production stage occurs—

When the major portion of the mineral production is obtained from workings other than those opened for the purpose of development, or when the principal activity of the mine becomes the production of developed ore rather than the development of additional ores for mining.

"It is possible for a mine to move back and forth between 'development' and 'production' with changes in the nature of its operations. The result in such a case would be that the same type of expenditures would be chargeable to capital account at one time and deductible as described above at another.

"When a development cost is charged to capital outlay it will be recaptured through cost depletion. However, if the mine uses percentage

depletion there will be no additional deduction specifically attributable to the capitalized development cost. This means that in such cases the capital outlays for development during the development stage are, in effect, never deductible for tax purposes, except where the deduction available under cost depletion exceeds that which may be made under percentage depletion.

"Witnesses appearing at the Committee's public hearings on this bill emphasized the serious tax consequences which result from the requirement that development costs must be capitalized if incurred while the mine is in the development stage. It was emphasized that this rule raises a serious obstacle to expansion in the mining industry. The problem is particularly acute at the present time because of the shortage of many essential minerals and the desirability of major developments in the case of certain minerals such as iron.

"Section 302 provides that expenditures paid or incurred after December 31, 1950, in the development of a mine or other natural deposit will be deductible ratably over the period during which the ores or minerals benefitted by such expenditures are sold. This provision will apply even though the ore or minerals were produced in a year other than the year of the sale. This rule applies only when the expenditures are made after the existence of ores or minerals in commercially marketable quantities has been determined and the development stage has begun. It is not applied to oil or gas wells, where the problem at issue has been dealt with through the optional deduction of intangible drilling and development costs in the year they are incurred."

A further amendment contained in the bill and which applies to Section 117 (k) (2) grants capital gains treatment in the case of royalties received by coal lessors, in the following language:

"(2) In the case of the disposal of timber or coal (held for more than 6 months prior to such disposal) by the owner thereof under any form or type of contract by virtue of which the owner retains an economic interest in such timber or coal, the difference between the amount received for such timber or coal and the adjusted depletion basis thereof shall be considered as though it were a gain or loss, as the case may be, upon the sale of such timber or coal. Such owner shall not be entitled to the allowance for percentage depletion provided for in Section 114 (b) (4) with respect to such coal. In the case of coal, this paragraph shall not apply if such owner is personally obligated to pay a share of the cost of mining operations."

In commenting on this amendment, the Committee stated that most leases on coal properties are long-term and call for royalty payments expressed in cents per ton. Therefore, the lessor does not receive the automatic adjustment for price changes which occurs when a royalty is expressed as a percentage of the value of the mineral extracted from the property. Many of the existing coal leases are old and the royalty payment called for under them is small.

The Tax Committee of the American Mining Congress meets July 10 to prepare for presentation of the position of the mining industry to the Senate Finance Committee on the pending bill.

Social Security

Chairman Forand (Dem., R. I.) of the House Ways and Means Subcommittee on Unemployment Insurance will open hearings July 18 on two pending bills. Forand has announced that no controversial measures will be considered until after the Congressional recess.

Of the two bills to be considered, one would provide Federal civilian employees with unemployment compensation benefits under conditions prescribed in State unemployment compensation laws, while the other would make minor changes in certain agricultural exemptions.

It is believed that consideration will go over until Fall on the bill introduced by Forand, which would redefine the term "employe" and would bring about a change in the common-law status of mine leasers and other independent contractors. It is to be hoped that the subcommittee will ultimately decide to drop this harmful bill.

It is interesting to note again the personnel of the other members of the subcommittee: Reps. Noble J. Gregory (Dem., Ky.), Walter K. Granger (Dem., Utah), Burr P. Harrison (Dem., Va.), Roy O. Woodruff (Rep., Mich.), Noah M. Mason (Rep., Ill.), and Thomas E. Martin (Rep., Iowa).

Trade Agreements

Final action in extending the President's authority to negotiate foreign trade agreements for two years from June 12, 1951, came with White House approval of the measure June 16 (Public Law No. 50). Somewhat unpalatable to the Administration, the extension of the law includes the "peril point" and "escape clause" amendments designed to give relief to domestic industries which are injured or threatened with injury by excessive imports. It also provides for suspension or withdrawal of tariff concessions that go to Communist nations under the trade pacts.

In signing the bill the President criticized the peril point provisions as "cumbersome and superfluous," saying they "do not materially add to the safeguard which already exists under present administrative procedures."

Defense Act

Bills amending and extending the Defense Production Act of 1951 are now under debate on the floors of both the Senate and the House. Both bills would curb the Administration's authority to roll back prices.

The measure in the Senate would extend wage, price and rent control powers until March 1, 1952, with other provisions of the current law—
(Continued on page 60)



Berryman in the Washington Evening Star



Personals

Dwight H. Plackard, Dallas, Tex., has taken over the duties of the executive secretary and treasurer of the New Mexico Miners and Prospectors Association, New Mexico's mining industry trade and service organization.



Plackard has been active in public relations and related fields for 15 years. A former newspaper man, he has had wide experience in organizational work and has directed publicity and public relations programs for several associations and business groups.

Jack Pierce, former secretary and treasurer, is to be the assistant editor of *Compressed Air Magazine*.

H. B. Crandall, Denver, is the new president of the Rocky Mountain Coal Mining Institute. He was named at the annual convention of the Institute held in Salt Lake City in June. Clement Audin, Andrew Gacie, John Peperakis, Arthur K. Perry, and S. H. Clarke were elected vice-presidents.

James N. Sherwin has been elected a vice-president of The M. A. Hanna Co., it was announced recently. A native Clevelander he joined Hanna's Lake Coal Division upon his graduation from Princeton in 1933. He has been vice-president of Hanna Coal and Ore Corp., and is vice-president of the American Coal Sales Association and a director of North Western-Hanna Fuel Co. and of Empire-Hanna Coal Co., Ltd., of Toronto, Ontario.

Appointment of Charles R. Curtin as manager of industrial sales and Joseph E. Cooke, Jr., as manager of domestic sales has been made by Appalachian Coals, Inc.

An announcement of the appointment of Daniel S. Wilkin as director of personnel of Reserve Mining Co. was recently made by R. G. Adair, director of personal relations, Armco Steel Corp. Wilkin, who has been

employment advisor at Armco, will be succeeded by Rowan F. Crawford.

H. C. Rose, president of the Pittsburgh Coal Co. Division of Pittsburgh Consolidation Coal Co., has announced the election of Thomas G. Ferguson to vice-president of Pittsburgh Coal. Ferguson started work for the company in 1934 and was a division superintendent at the time of his promotion.

The honorary degree of Doctor of Engineering was presented David A. Wallace, president of the Chrysler Division, Chrysler Corp., recently by the Michigan College of Mining and Technology. Endicott R. Lovell, president of the board of control of the school and president of the Calumet and Hecla Consolidated Copper Co., made the presentation address.

Grandview Mine, owner of the property at Metaline Falls, Wash., has appointed Eskill Anderson as resident engineer. Anderson will look after the company's mining interests in Stevens County, Wash.

R. E. Snoberger, formerly president of the Binkley Coal Co., has been elected executive vice-president and a member of the

board of electors of the Truax-Traer Coal Co. Snoberger joined the Binkley organization in 1933. He has been with them since, except for the year 1942 when he was on leave with the U. S. Government as director of the Mining Section, Industrial Salvage Bureau of the War Production Board.

Gregory S. DeVine was named president of the Binkley Coal Co. following Snoberger's promotion. DeVine joined the sales force of the Binkley Coal Co. in 1934, rising to vice-president in charge of sales in 1946.

Thomas E. Camp, Jr., recently joined Southwest Potash Corp., New York, as vice-president in charge of sales. Camp formerly was division manager of the Armour Fertilizer Works, Atlanta.

Raymond E. Salvati, president of the Island Creek Coal Co. and the Pond Creek Pocahontas Co., has succeeded H. A. Glover as president of the Island Creek Coal Sales Co. Glover has retired from that position but will continue his present affiliation as a consultant.

At the annual meetings of The Lorain Coal & Dock Co. and The

Lorado Coal Mining Co. in Columbus, Ohio, S. B. Johnson was re-elected president and director of both companies. J. R. Johnson was re-elected vice-president of both organizations and A. C. Saunders, Jr.,

S. B. Johnson was re-elected vice-president of The Lorain Coal and Dock Co.

Cecil A. Fitch, president of the Chief Consolidated Mining Co., has announced the appointment of Hollis G. Peacock as chief geologist. Peacock was formerly on the staff of the U. S. Smelting Refining and Mining Co.

The Southern Coal and Coke Co. recently announced that E. H. Brooks has been elected as vice-president in charge of sales. Brooks, formerly northern sales manager of the company is also president of the Cincinnati Coal Exchange.

William H. Hoover, president of the Anaconda Copper Mining Co., was the principal speaker at the commencement exercises of the Montana School of Mines on June 9 in Butte.

In a series of personnel changes recently announced by the Tennessee Coal, Iron and Railroad Co., E. H. Stevens was appointed superintendent of industrial relations at the ore mines and quarries division of the company. M. E. Baird was made assistant superintendent of industrial relations at the same time.

Former ore mines and quarries superintendent of maintenance, James E. Breth, was appointed chief engineer of the coal mines division and Howell J. Broughton was elevated from assistant works industrial engineer to assistant chief engineer at the coal mines.

Other appointments include: W. M. Childress to director of personnel; C. R. Davis, Jr., to director of safety and plant protection; E. L. Cole to supervisor of plant protection; and W. M. Leman to staff assistant.

C. S. Thayer, manager of the smelting and fabricating operations of the Aluminum Co. of America at Vancouver, Wash., has been promoted to manager of the company's Pacific Northwestern operations. He will manage the new Alcoa smelting plant to be built at Wenatchee, Wash., in addition to his Vancouver duties.

Charles S. Blair, formerly vice-president of The Black Diamond Coal Mining Co., Birmingham, Ala., has been elected president of the company.

Oscar A. Dingman, professor of mining at the Montana School of Mines in Butte, was elected president of the Montana Society of Engineers, succeeding **Robert W. Lawson** of the Ingersoll-Rand Co., now a resident of New York.

Appointment of **R. Herbert Knapp** of Uniontown, Pa., as chief mining engineer of United States Steel Co.'s coal division has been announced.

A native of Atlanta, Knapp attended Georgia School of Technology and Columbia University. His career began in 1931 as an engineer with the Philadelphia and Reading Coal and Iron Company. He joined U. S. Steel in 1943 as assistant mining

engineer for H. C. Frick Coke Co. at Uniontown. He was appointed mining engineer in 1945 and was promoted to chief engineer of the company in June, 1947. Since last January, he has been chief engineer of U. S. Steel's Frick coal division.

William Gage Brady, Jr., William C. Potter and Clyde E. Weed, all of New York were elected directors of the Anaconda Copper Mining Co., at its annual stockholders meeting in Anaconda, Mont.

Glenn O. Kid, vice-president in charge of sales, Lehigh Navigation Coal Co., has announced two recent executive appointments. **John W. Rutledge** has been appointed manager of industrial sales. **Edwin L. Willson** has been named director of research.

Formerly assistant comptroller of Lehigh Coal & Navigation Co., Rutledge will be responsible for the marketing and sale of all anthracite sizes. He is a graduate of Northwestern University and Harvard Graduate School of Business Administration.

Willson, former manager of industrial sales, is responsible for many of the improvements in the use of fine anthracite sizes. He has been associated with the industry since 1924.

Dr. I. M. LeBaron has been appointed director of research laboratories for International Minerals & Chemical Corp., according to an announcement by Dr. Paul D. V. Manning, vice-president of the corporation in charge of research. Dr. LeBaron has been a research engineer with International since 1942.

His major responsibility as director of research laboratories will be the direction of programs being conducted in the various research laboratories of the corporation. He will continue to report directly to the vice-president in charge of research, and will aid him in special assignments.



Anthracite Institute has employed **William E. Doughty** as a field representative in the Delaware, Maryland and District of Columbia territory to replace **John Hensyl** who was called back into the Armed Services.

G. D. Creelman, previously director of research, has been named by the M. A. Hanna Co., Cleveland, as research coordinator. **D. N. Vedensky**, private consultant for Hanna and in charge of metallurgical research and development for several years, has been appointed director of research and development. Offices of **R. C. Fish**, general manager of iron ore operations, will be transferred from Duluth to Cleveland. The company also announces that **Morris Bradley**, who has been with Hanna since 1946, has been named director of public relations.

Clarence M. Hays has been appointed mining engineer of Pittsburgh Coal Division of Pittsburgh Consolidation Coal Co., according to an announcement of **H. C. Rose**, president of Pittsburgh Coal. Hays was division engineer of the company's Renton Division before his promotion.

—Obituaries—

Sumner H. Compton, prominent Seattle mining engineer, died recently of a heart attack in Caracas, Venezuela, while on a three-week gold prospecting trip in South America. He was found dead in his hotel room by friends after he failed to catch a bus to the airport to take a plane to New York at the conclusion of his trip. He was 50 years old.

Edward L. Clair, 57, died June 13 at his home in Cleveland after a long illness. A native of Washington, Pa., Mr. Clair graduated from Carnegie Institute of Technology, Pittsburgh, in 1914. In 1913 he was captain of the Carnegie Tech football team. He joined Interlake Iron Corp.'s blast furnace department in 1920 and became superintendent of the department in 1926. In 1928 Mr. Clair was made plant manager. He was president of the company at the time of his death. He was also president of the Olga Coal Co., first vice-president of the Palmer Mining Co., the Dalton Ore Co., and a number of other firms in Cleveland and Chicago.

On May 22, **John B. Putnam**, 58, former general counsel of Pickands, Mather & Co., died after a short illness in Cleveland. Mr. Putnam was stricken only ten days after returning from a vacation. Born in Fredonia, N. Y., in 1893, he was educated in Fredonia public schools and graduated from Cornell in 1914 with a Bachelor of Law Degree. In 1917 he entered the U. S. Army and served

for two years. Upon discharge he became general counsel for Pickands, Mather & Co., later resigning to enter private law practice in Cleveland as a member of the firm of Andrews, Hadden and Putnam. Mr. Putnam was greatly interested in the organization "Workers for World Security." Director and vice-president of the American Mining Congress for some years, his work did a great deal for the progress of the mining industry.

Ray E. Tower, western mining engineer and former resident of Butte, Mont., died recently in Salt Lake City.

Julles Lebanthe, 77, noted mining engineer, died recently in Berkeley, Calif. He had mined not only in the Pacific Northwest, but in Alaska, South Africa and Russia as well.

Walter M. Charman, president and founder of The Ferro Engineering Co., Cleveland, died June 15 at Lakeside Hospital in Cleveland.

Mr. Charman was born in Terre Haute, Ind., in 1894. He received his college education at Rose Polytechnic Institute, graduating in 1918 with a Mechanical Engineering degree. After working with the Youngstown Sheet and Tube Co., rising to the position of superintendent of the Open Hearth Department, Mr. Charman organized The Ferro Engineering Co. in 1929.

A member of the several professional societies, he was a well known figure in the world steel industry.

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Climax Slushing Practice

(Continued from page 29)

drum, hoists and 40-hp, three drum, portable hoists are standard equipment for development work in driving haulage drifts, slusher drifts, ventilation drifts and entries. In conjunction with the development slushing and the hoists mentioned above, 3-ft, 3½-ft, and 4-ft rigid type scrapers are used. As this paper deals primarily with the slushing practices used in the loading and production of ore, rather than for development, no further detail will be given to this lighter-type of equipment.

In designing a hoist for slushing operations in the standard Climax slusher drifts, many factors and problems have arisen to influence the changes incorporated into the present hoist. Many additional changes are anticipated before a truly efficient design is reached. Such operating factors as fleet angle, compactness of unit, rope speed, overload and shock protection, location of operating controls, type of controls, relative heights of ropes with respect to slusher drift and drums, and maximum safety, all play a very important part. With respect to maintenance, design factors: for ease in making repairs, for maintaining a minimum misalignment and power loss, which provide ruggedness and maximum life of parts with minimum maintenance cost, and which allow quick assembly or dismantling for

easy transport from one location to another must all be carefully considered if best results and efficiencies are to be realized.

Try Remote Control Hoist

There have been but three variations of heavy duty production hoists used at Climax. The pioneer hoists for early operations were 75-hp, two-drum, manually controlled, Sullivan and Vulcan planetary-gear type machines. These were found to be a little light for the size of rock and the production required. The next hoist developed was set up as the standard and is still being used, with a few minor improvements and changes, in some 75 active slusher drifts throughout the mine. It is a heavy, planetary-type, Vulcan, two-drum hoist with manual controls, used with either a 100-hp or a 150-hp electric motor drive. An experimental, two-drum, 100-hp Sullivan remote controlled hoist is now in operation in one of the main production drifts. This machine shows some advantages and some disadvantages over the manually operated Vulcan. It has not been tested long enough to draw any conclusions yet. Other comprehensive tests involving changes in design and operation of slusher hoists are now being carried on as a means toward perfecting this phase of the operation. All slusher hoists operate from 440-v, three-phase, 60-cycle lines.

The present standard slusher hoists are 12 ft long, measured on the center line of the drums. Since the slusher

drifts themselves are but seven-ft wide, proper hoist installation and location is a major problem. The hoists are now set so that the nose drum is on the center line of the drift. The tail drum is, therefore, located about two ft off the drift center line and with the fleet angle thus imposed, cable wear and strains through improper winding are increased. A 1½-in. rope of 6 by 19 improved plow steel construction has proved most satisfactory. To date, the most adaptable rope speed has been established at 250 fpm, giving an effective rope pull of 18,500 lb with the 150-hp drive. In order to obtain a minimum of rope wear on the bottom of the slusher drifts and from high muck piles at the fingers, both the nose and tail cables are taken from the top of the drums. To further increase the height of the cables at the hoist, the hoist base is set a minimum of 18 in. above the scraping floor of the drift. The manually operated controls of the Vulcan hoist seem to present an advantage over remote type of controls in that: men can be trained more easily and quickly to operate the scraper properly, much more action and maneuverability can be obtained with the use of the Climax folding-type scraper, and the slusher operator is able to "feel" the scraper action through the controls and thus direct its movements even though visibility may be poor. Heavy steel guards are placed on the Climax hoists between the operator and the scraper as protection against flying objects and whipping ends of broken cables.

Wheels of Government

(Continued from page 56)

ing priority and allocation authority, loans, long-term purchase agreements, and credit controls extended to June 30, 1952. The House bill would extend all powers in the current Act to June 30, 1952.

Under the Senate bill no ceiling price on any commodity could be set below either (1) the price prevailing on the day before price ceilings were first adopted on that commodity, or (2) the price prevailing in the period January 25 to February 24, 1951. This would block the price roll-backs scheduled to go into effect on July 1. The House bill would block any future price roll-backs, on agricultural commodities only, below 90 percent of the May 19, 1951 level.

While the Senate Committee on Banking and Currency turned down any expansion of the authority to pay subsidies, the House Committee included in its reported bill the Administration proposal to establish subsidies for high cost producers on any domestically produced material "in such amounts and in such manner" as the President determines to be neces-

sary to insure continued production of commodities "necessary to carry out the objectives of the Act." It will be remembered that the American Mining Congress urged both Committees that in case any subsidy program is found necessary to bring out increased production of metals and minerals, such subsidies be applied on a uniform basis to all new or increased domestic production above that for a specified base period such as 1946-1949.

Freight Rates

Representatives of the coal industry have protested any further increase in freight rates on coal at the hearings which are under way before the Interstate Commerce Commission. Emphasis has been laid upon the loss of tonnage to competitive fuels, due to freight rate increases that have been granted in the past. The parlous condition of the industry has been portrayed by realization figures, showing that coal operators have been forced to reduce mine prices in order to retain coal markets. Careful analyses of earnings and profits of coal-carrying railroads have been presented.

Further testimony has stressed the inroads made into coal sales by the invasion of oil in eastern markets, and has warned that the freight rate increases sought by the railroads will be sufficient to make household consumers turn to other fuels. The witnesses presented data showing the revenues lost to the railroads by diversion from coal to natural gas and other fuels. It was submitted that the coal mines are contributing more than their fair share of the out-of-pocket costs and overhead burden of the railroads, and that further freight rate increases will divert heavy coal tonnage to movement by truck and barge.

Assessment Work

Moving quickly to beat the July 1 deadline, Senator O'Mahoney has secured Senate passage of a bill which changes the deadline date for beginning annual assessment work on mining claims from July 1 to November 1. Prompt enactment of the measure is in prospect as Chairman John R. Murdock (Dem., Ariz.) of the House Committee on Interior and Insular Affairs is driving hard to effect immediate passage.

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*Includes 62,070 employees of six companies which did not have plan before canvass.

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MINING CONGRESS JOURNAL



NEWS and VIEWS



Eastern States

Coal Men Meet

Coal mining men met in Bluefield on June 22-23, at the summer meeting of the West Virginia Coal Mining Institute. The two-day event included three technical sessions, a business session, a luncheon and a banquet Saturday evening.

Friday afternoon the Institute was addressed by Charles W. Connor, administrator, Defense Solid Fuels Administration, on the topic, "Materials Supplies and Priorities." The honorable Rush D. Holt, Weston, W. Va., used as his theme, "The Alarm Clock is Ringing," when he spoke at the banquet.

Coal Miners Honored

Medals of honor for heroism were awarded to Walter Legins of Alden Station, Pa., anthracite shaftman, and C. K. Merrifield, Tridelpia, W. Va., mine foreman, by the Joseph A. Holmes Safety Association.

Legins was honored for "displaying exceptional courage" in the rescue of a fellow worker trapped in a cage at the Auchincloss No. 2 shaft, Glen Alden Coal Co., Nanticoke, Pa. Lowered on a rope to a point 1200 ft below the surface, Legins worked atop the cage to get it back on its guides as debris continued to fall from the partially caved upper shaft.

Merrifield, section foreman in the

Valley Camp Coal Co.'s No. 3 mine, Tridelpia, W. Va., was awarded the medal for risking his life to rescue a miner from a rock fall. The miner was pinned against the rib and had his legs covered by rock. Two or three minutes after the rescue a new fall blanketed the area where the miner had been trapped. One miner was killed in the first fall.

Coal Pipeline Bill Signed

Ohio Governor Frank J. Lausche has signed a bill granting public utility status to pipelines for transportation of coal. Tests are being conducted at Cadiz, Ohio, by the Hanna Coal Co. to determine the feasibility of pumping fine coal, mixed with water, through pipelines.

Huge Ore Contract Signed

Hanna Coal & Ore Corp., a subsidiary of The M. A. Hanna Co., has entered into what is believed to be the largest iron ore sales contract ever made. Hanna will deliver to Bethlehem Steel Co. in excess of 30,000,000 tons of Labrador-Quebec ores over a period of 25 years. Shipments are expected to begin late in 1954. Bethlehem will accept de-



Representatives of the Army Corps of Engineers, Dravo Corp., U. S. Steel Co., and city and county governments attended the 3½-hour ceremony opening a new \$7,263,000 lock in the Monongahela River at Braddock, Pa. The first vessel through the 360 ft long by 56 ft wide lock was the U. S. Steel Co.'s "Homestead," downstream with two barges of coke.

liveries at Seven Islands on the north bank of the St. Lawrence River, the southern terminal of the 360-mile railroad now being built from Seven Islands to the ore fields.

Plan to Build Washer

Sharon Steel Corp. has disclosed plans to build a new coal washing plant at its Jo-Anne properties at Rachel, W. Va. Company officials feel that the plant will enable their blast furnaces to increase production, cut costs and make better iron. Estimates have been made that the output would increase as much as 150-250 tons daily.

Operator of the cleaning plant will be the Jo-Anne Coal Co., Sharon subsidiary.

Surveyors, Mappers Meet

The American Congress on Surveying and Mapping held its annual gathering in Washington, D. C., June 18-20. In attendance were representatives of practically every field of surveying and mapping in the Western Hemisphere and Europe. Theme of the session was "Surveys and Maps—the Basic Blueprints: For Peace and Development."

Among the papers presented by the widely known educators and leading map-makers was one entitled, "Map-

ping for the Development of Natural Resources in Ontario," by F. Weldon Beatty, surveyor-general of Ontario.

First Aid Teams To Meet

Safety in bituminous coal mines, which has been steadily improving under modern mining methods and has set new records for each of the past three years, will receive added emphasis next October 2, 3, and 4 when the National First Aid and Mine Rescue Contest will be held at Columbus, Ohio. Teams from all mineral industries have been invited to participate, and the bituminous coal teams are scheduled for serious competition from representatives of anthracite, lead, copper, and other industries.

Sponsored by the U. S. Bureau of Mines, producing companies, and organizations of mine workers, the contest is expected to attract more than 500 mine workers and officials from 35 states. W. H. Tomlinson, chief of the Vincennes, Ind., branch of the Bureau of Mines, is secretary of the contest committee.

Titanium Plant Proposed

Administrator Jesse Larson, General Services Administration, disclosed a proposal for the government to build a \$15,000,000 titanium plant. The program was discussed at a hearing before the House Banking and Currency Committee on the Defense Production Act. Citing a proposal before GSA for the Government to purchase titanium output in the amount of \$20,000,000, Larson claimed it would be more economical for the government to build and operate its own plant. He estimated that savings would be up to \$100,000,000.

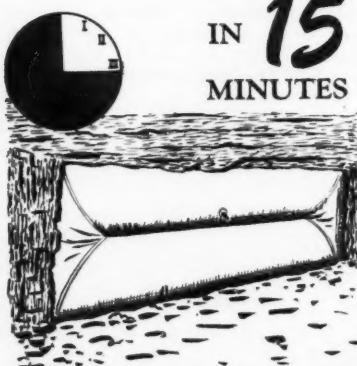
Private industry is not attracted to titanium production because of the high cost. It costs a dollar a pound to purchase titanium at this time and the military establishment has an expanded program for the metal Larson went on to explain.

New Educational Program

Dr. John R. Dunning, dean of the School of Engineering of Columbia University, recently announced plans for liberal education in engineering. Students are to complete three years of study at one of 12 liberal arts colleges of their choice and then enter Columbia's School of Engineering for two years of study. Satisfactory completion of the five-year program will result in appropriate Bachelor's degrees from both Columbia and the liberal arts colleges.

The program is being instigated to give the engineer a clearer understanding of the impact of his technology upon the nation's social, economic and political life as well as to make him competent in his own field.

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It's ABC's revolutionary new airtight *Inflatable Brattice*! Think of it—a brattice that can be transported, erected and disassembled by one man—erection time 15 minutes! ABC *Inflatable Brattice* goes up in one unit, comes down in one unit—with a simple air pump the only erection equipment required. Molded itself around sloping or jagged edges for an airtight fit. Its tough neoprene fabric lasts far longer—for installation after installation without noticeable wear. For unequalled Brattice Installation and service-life economies, write ABC direct . . . now!

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SAFETY FIRST — and the last word in efficiency and economy. That's the formula that adds up to faster haulage and handling when you use Ryd-in mine car couplers.

SAFER — Instant, positive engagement. No manual assistance needed.

SPEEDS UP HAULAGE — Ryd-in Couplers eliminate slack, stabilize moving cars, minimize danger of derailment. Result: more tonnage moved at higher speeds and at lower cost.

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FASTER HANDLING — Quicker shunting. Rotary dumping accomplished without uncoupling.

Ryd-in Mine Car Couplers are manufactured exclusively by The Buckeye Steel Castings Co.

*Let Ryd-in make a test installation on your equipment.
Write for details.*

RYD-IN

RYD-IN RAILWAY EQUIPMENT CO.

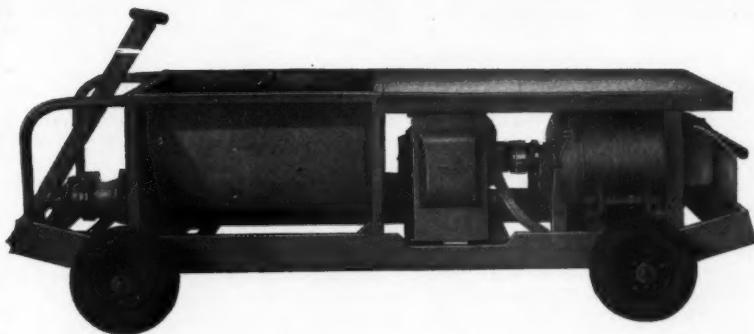
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Chief...

New, mobile and portable. "Heap big power dusting job." Through 50 to 250 feet 1 1/4" hose . . . mounted on carriage, as illustrated, or with winch on skids . . . pulls itself on and off cars and conveyor belts . . . travels on skids 40 feet per minute, can be supplied without winch. May be had dust tight or Bureau of Mines approved, permissible with trolley tap or permissible plug for use on shuttle car. Write for full specifications. Please use street and zone numbers. Mechanical Track Cleaners—Rock Dusters—Automatic Doors—Car Transfers—Cable Splicers & Vulcanizers—Safety Signal Systems.



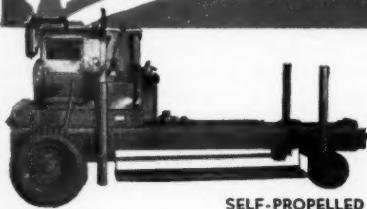
Specifications: Length (with winch) 8'-6"; length (less winch) 7'-0"; height (on skids) 18"; width 20"; weight (with winch) 825 lbs., weight (less winch) 630 lbs.; hopper—capacity 2 1/2 sacks; motor—3 1/2 H.P., 1750 R.P.M. compound wound; voltages available—90, 230, 550 D. C., 220-440 A. C.; starter—across the line, overload and fuse protection; air pressure 5 to 8 p.s.i.; hose—5 to 250 ft. of 1 1/4" ID dusting hose; dusting capacity—35 to 50 lbs. p.m. dry rockdust; bearings, motor, blower, winch, conveyor—anti friction. Safety overload releases; quick hose attachment.

American Mine Door Co.

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FOR BLAST HOLE DRILLING

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• McCarthy Vertical Drills adapt to any job where ordinary rock formations are to be blasted.

Designed with compact retractable hydraulic tower for Truck, "Cat," Half-track or jumbo mountings. Power shafts made of tough alloy steel. Simplified construction throughout.

Over-all height with tower reclining: 7 ft., 4 in. Wt.: 5,100 lbs. All McCarthy units can be operated with Gasoline, Diesel or Electric power units. Write for descriptive literature.



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Coking Coal Survey Made

Known coking coal reserves underlying Pike County, Ky., are estimated at 3,916,000,000 tons, of which more than 80 percent are in beds 28 in. or more in height, according to Bureau of Mines Report 4792. Realizing that 28 in. seams are about the thinnest being mined and that the historic average of coal recovery in the country is just over 55 percent, the report estimates that 1,757,000,000 tons are recoverable under present mining practices.

The estimate of reserves is probably low, as 10 of the country's 17 coal beds are of minor importance now and have never been extensively explored.

Safety Trophies Awarded

Six mines, quarries and open pit operations in the United States were awarded "Sentinels of Safety" trophies in the 26th National Safety Competition conducted by the Bureau of Mines. The awards were made for working without lost-time injuries and achieving outstanding safety records last year.

Award of the trophies is based upon a tabulation of injury records of competing anthracite mines, bitu-

minous coal mines, metallic and non-metallic mineral mines, open pit mines and quarries. A total of 556 mines and quarries, working nearly 147,000,000 man-hours, were enrolled in the 1950 competition.

African Iron Ore Arrives

The first shipment of West African iron ore to reach the United States arrived at Baltimore June 22, from Liberia, West Africa, when the *SS Simeon G. Reed* under charter to the Farrell Steamship Line docked with a cargo of 10,000 tons.

On the dock to welcome the *Reed* were the Liberian ambassador, C. D. B. King, L. K. Christie, president of Liberia Mining Co., Ltd., T. F. Patton, vice-president of Republic Steel Corp., which company is a substantial owner in the mining company, and representatives of the Department of State, of the Import-Export Bank, of the Baltimore & Ohio Railroad and of the Port of Baltimore.

On its arrival in Baltimore the ore was loaded immediately for consignment to Republic's plants in Cleveland, Warren, Youngstown, Canton and Massillon.

With an iron content of up to 70 percent as compared with an iron con-



Sizes and accessories for your individual requirements. Write for information and sample.

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tent averaging 51 percent for Lake Superior ores, the Liberian product approaches pure iron oxide which contain approximately 71 percent of iron and 29 percent oxygen. Because of the high iron content and the fact that this is a lump ore, it will be used directly in the open hearth furnaces to assist in carbon reduction.

For the next several months the iron ore will be shipped in chartered cargo vessels but sometime early in 1952 the first of a fleet of 23,000-ton ore carriers, built for the Liberian Navigation Co., of which Republic is half owner, will take over. Ore not needed by Republic will be sold on the world market.

AEC Patents Released

Descriptions of 26 patents owned by the U. S. Government and held by the Atomic Energy Commission have been transmitted to the U. S. Patent Office for registry and listing in the official register of patents. Patents range from "Guiding Means for Movement of Solid Materials," to "Photo-Multiplier Circuit," and include "Separation of Radium from Barium."

The AEC will grant non-exclusive, royalty-free licenses on the patents as part of its program to make non-secret technological information available for use by industry. A total of 284 AEC-held patents and patent applications has now been released for licensing.

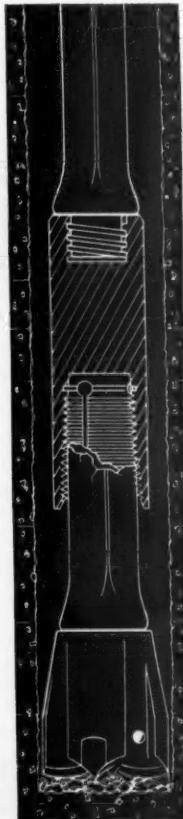
Coal Study Made

With the school term coming to an end, a school boy from Alberta, Canada, decided to learn something about coal. The result was that Bituminous Coal Institute received the following letter: "Please send me all the booklets you have about coal, and please try to hurry because we are going to have our exams pretty soon. Boy, does time go fast. Well, once again, please try to send all the booklets and hurry." BCI sent suitable literature but has not learned the results of the examination.



hole saving fishing tool

The Rock Bit outside fishing sleeve is attached to conventional steel threaded for Rock Bit R-1 or R-2 or Timken H or D steel. The tool threads itself securely onto the broken steel, making extraction easy. R-1 or H threaded Hole-Saver will extract $7/8$ ", 1" and $1\frac{1}{8}$ " Hex. or Q. O. —R-2 or D will extract $1\frac{1}{8}$ " or $1\frac{1}{4}$ " Rd. to save both bit and hole. It pays for itself. Request folder. Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa. Branch: 350 Depot St., Asheville, N. C.



Grounding and Circuit Protection

(Continued from page 51)

breaker with current transformers and overcurrent and ground protective relays should be installed in each feeder which is to be connected to any portable unit. Current transformers in branch feeders (including any such at the substation) may be of the three-phase, balanced-flux type, or three single phase type with balanced current connection.

Current transformers and relays for ground-fault protection should provide for tripping on fault currents over a range down to approximately 25 percent of the maximum value determined by the current-limiting resistor, as a high-impedance fault may hold currents to values less than the maximum.

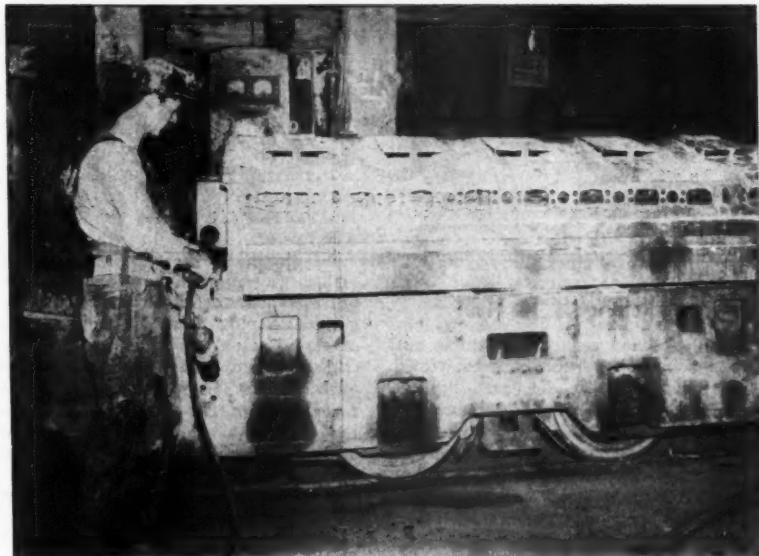
Portable transformers for stepping down voltage to a value suitable for distribution in the working areas and for motors and controllers on mining machines should have the low-voltage windings wye-connected to provide a neutral point for grounding, or if delta-connected, a zig-zag grounding transformer should be installed to provide a neutral point.

Between the neutral point and the common system ground wire connect a resistor designed to limit the maximum ground-fault current in the low voltage circuits to 5 amperes.

In each low-voltage feeder circuit taken from the portable transformer unit install an air circuit breaker of adequate current-carrying capacity and interrupting rating, with thermal and instantaneous magnetic overcurrent trips and with shunt trip connected to a ground protective relay in the ground wire of the feeder. Ground relays in these units should provide a short time delay, if selective ground-fault tripping of individual motor or machine feeder breakers in face distribution units is required.

Install in face distribution units air circuit breakers with thermal and instantaneous magnetic trips and with ground current trips (or if preferred with shunt trips and ground protective relays) for each motor or machine feeder on which selective overcurrent and ground-fault tripping is required.

Grounding transformers, resistors, current transformers, ground protective relays and ground trip coils should be capable of carrying continuously the maximum ground fault currents, so that the protective circuit will not be burned open if a protective device should fail to clear a circuit on which a ground fault exists.



are you getting FREE HAULAGE POWER?

IF THE CURRENT for your locomotives and other haulage equipment is drawn right from the line during costly peak-load periods, you'll be interested in what the mechanical engineer of a big metal-mining company says:

"Our storage-battery locomotives are charged during the graveyard shift and since this is the off-peak power period there is no cost for the energy used; power settlement is made on a peak basis only."

EDISON Nickel-Iron-Alkaline Storage Batteries are ideally suited to such an arrangement because they normally need only six to seven hours of charging. This gives you ample time to inspect and charge them during off-hours. That's because they can be charged at an average of full normal rate without injury. They don't need

critical rate adjustments, either, and so can often be charged right from d-c lines.

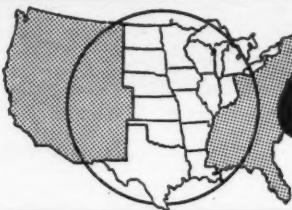
Edison cells are hard to hurt . . . they're built of steel inside and out . . . and their electrolyte preserves the steel. They can't be injured by standing idle, freezing, accidental short-circuiting or reverse charging. In short, they stay on the job . . . out of the repair shop.

Initially, EDISON batteries cost a little more. But when you rate them in terms of years worked, tons hauled and down-time saved, you'll agree that they're the best investment you can make. Ask any user! Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. In Canada, International Equipment Company, Ltd., Montreal and Toronto.

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STORAGE BATTERIES**



Central States

Metallurgists To Meet

Metal resources, upon which rest the security and freedom of the world, will be thoroughly discussed by top-ranking metal scientists and engineers from the free nations of the world when they gather in Detroit, Mich., October 14-19 to attend the World Metallurgical Congress, first international conclave of its kind.

More than 500 "conferees" from upwards of 20 countries will assemble for an "exchange of ideas" and join with the American metallurgists who will participate, according to Walter E. Jominy of Detroit, staff engineer of the Chrysler Motor Corp. and president of the American Society for Metals, which is sponsoring the world scientific meeting.

In announcing the World Metallurgical Congress, Jominy pointed out that the full support of the Economic Cooperation Administration had been

extended. A technical assistance program covering visits of "delegations of metal scientists" from ECA countries has been established as the result of a request from the Organization for European Economic Cooperation. It is by far the largest technical assistance program yet undertaken by the ECA.

"Conferees" are to arrive about September 15. They will spend approximately five weeks in the United States. During the first four, they will be divided into eight groups participating in a series of study tours to industrial, government and educational institutions to observe at first hand the scientific, industrial and educational advances that have taken place in this country during the past few years. Some 150 plants in 13 states and 57 cities are to be visited.

Dr. Zay Jeffries, of Pittsfield, Mass., retired vice-president of the General Electric Co. and president of the

American Society for Metals, has been appointed director general of the World Metallurgical Congress.

Dr. Jeffries will help shape the program of the Congress, especially as it relates to world metal resources.

Mindful of the free world's desire for continued peace, Dr. Jeffries stated recently that "the only way people can have peace with freedom in this troubled world is to be strong. Strength insures a high standard of living. There is no way to divorce our standard of living and our military potential from a healthy metal industry." He pointed out that the time has come for us "to wage peace with industrial strength."

This meeting is expected to further international understanding, say its leaders. It will provide broad opportunities for the interchange of ideas among scientists "that will bear on more efficient production for defense that ultimately means freedom and peace."

Early in the Congress a comprehensive summary of raw materials of the world as they relate to the metal industry will be presented. Visiting authorities from European and other free countries, Canada and the United States will discuss problems of "conservation, utilization and substitution of strategic metals."

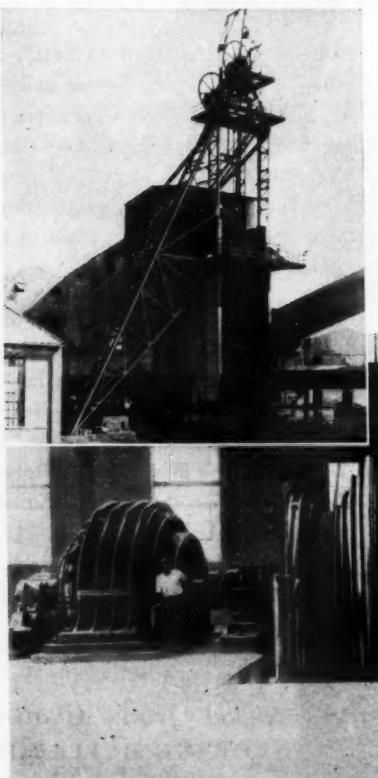
Gold Output Up

Only two mines, the Homestake at Lead and the Bald Mountain at Trojan, produced gold in South Dakota during 1950 but they increased production of that metal by 30 percent over the 1949 figure, at the same time showing a 22 percent increase in silver output. With gold selling at \$35 an ounce and silver for a little more than \$0.905 an ounce, gold output was valued at \$19,879,860 and silver was valued at \$128,576.

The Homestake, the largest gold mine in the United States, operated continuously and treated an average of 3466 tons of ore a day. Bald Mountain Co. operated its mine and an all-sliming cyanide mill continuously, treating about 345 tons of ore a day. It increased gold output by nine percent and silver output by 21 percent over 1949.

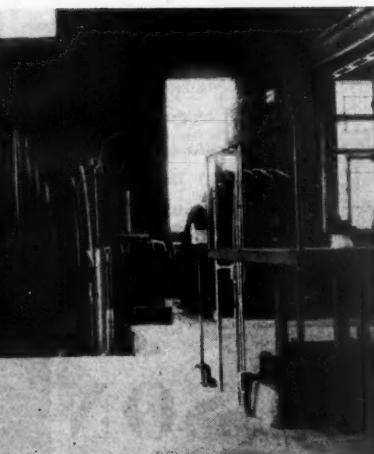
Phosphate Company Bought

According to an announcement made by Franklin Farley, vice-president in charge of the Phosphate Division of International Minerals & Chemical Corp., International has purchased the Thompson Phosphate Co. Organized in 1920 with headquarters in Chicago, the phosphate company maintains a sales and distributing organization for the distribution of fine ground phosphate rock.



Hoisting Record Stands

A world's coal hoisting record, 15.175 tons in an eight-hour shift, was established in 1928 at the Orient Mine No. 2, West Frankfort, Ill. This record still stands, and a total of over 51,000,000 tons of coal had been hoisted up the 600-ft. shaft by January 1, 1951. Pictured at the left is the tipple of the Chicago, Wilmington and Franklin Coal Co.'s Orient Mine No. 2. The hoisting room is shown below.



To Buy Mine Locomotives

A recent ECA press release listed \$350,000 for railroad transportation equipment and parts for Turkey. This equipment which must be procured in the United States, includes 15 mine trolley locomotives for the Zonguldak coal mining development, an ECA project.

Eti Bank, Ankara, Turkey, is to be the purchaser. The Paul Weir Co., Chicago, Ill., has the management contract for the development of these mines.

Tipple Being Built

An all steel and concrete preparation plant and tipple is being constructed by the McNally Pittsburg Mfg. Corp. for Dakota Collieries Co., Minneapolis, Minn. The new plant is being built near the site of the old tipple at Zap, N. D. It will feature latest coal handling equipment, including three crushers, boom loading and oil treatment. Capacity will be about 350 tons per hour of lignite.

Stripping at the Dakota Collieries plant is done by a Marion Model 7200 dragline and a P&H diesel dragline. The coal is loaded into seven 20 ton coal haulers by either an electric or diesel shovel.

When the tipple is completed, the Dakota Collieries Co.'s lignite plant will be one of the most modern mines in the northwest.

Inspect Iron Range

Members of the House of Representatives public works committee inspected facilities of the iron ranges in Minnesota early in June as part of its study of the St. Lawrence seaway and power project. They inspected an open pit mine, an underground mine, an ore beneficiating plant, a taconite plant and then visited the ore docks at Duluth. During the hearings of the committee it was stated that the seaway would assure the U. S. of a new source of iron ore in Labrador to supplement the Mesabi range deposits.

Research Consolidated

Calumet & Hecla Consolidated Copper Co., one of America's oldest copper mining companies, has recently consolidated its research activities for the Calumet Division in a newly modernized building located at 1132 Calumet Avenue, Calumet, Mich.

The new Research Center provides modern offices, library, metallurgical

and chemical laboratories for the expanded staff required to meet the challenge of perpetuating Michigan's copper industry. Calumet & Hecla's diversification program has brought a number of new activities into the sphere of the company's operations, and further contributions are anticipated in the fields of chemistry, metallurgy, agricultural chemicals, and new product development.

Zuvekas Suit Upheld

Clarence Zuvekas, a Joplin, Mo., mining man won his suit against the Reconstruction Finance Corp. In an opinion handed down by Judge Albert A. Ridge at Joplin, it was ruled that the case was similar to the Childress case in which Childress and associates were not liable for repayment of \$75,000 borrowed from the R. F. C. and expended in mining operations that showed no profit. A mistake was made in the contract by the R. F. C. agent in both cases. Therefore, the judge held that Zuvekas was not held liable for the repayment of the money. Judge Ridge's decision has been upheld by Eighth United States District Court of Appeals on an appeal by the R. F. C.

Several years ago Zuvekas and

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— DRILLS —

New Traction Drive with Forward and Reverse



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The new Parmanco Hi-Speed Horizontal Drill is completely redesigned around a 40-H.P. engine with four drilling speeds which, in field tests, has cut one-third off the footage drilling time—a cost-per-drilling-foot saving that we are passing on to the strip mine operator and contractor at no increase in our price. In addition, the drill is equipped with a starter and generator, dual type front wheels, truck type rear axle with mechanical brakes and a traction drive with both forward and reverse.

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associates took over the abandoned Ramsay mine and mill and opened some very rich ore bodies. Known as the Lavrion Mining Co., it was a successful venture. Involved in the present suit was the pumping of a shaft on the Garrett land, two miles north of Picher, Okla. The 400 ft shaft had been sunk by the Eagle-Picher Co. Zuvekas installed three electric pumps which failed to de-water the shaft.

the amount of work that must have gone into the translation.

Miners, metallurgists, book collectors, historians, all will find something of value and interest in this book.

FUELS AND COMBUSTION HANDBOOK. *Editor, Allen J. Johnson, Consulting Mechanical Engineers, Lansdowne, Pa., and Associate Editor, George H. Auth, Professor, Mechanical Engineering, Villanova College. Published by McGraw-Hill Book Co., Inc., New York. 1951. \$12.50. 915 pp.*

A practical handbook containing factual data on the properties, characteristics and uses of all solid, liquid, and gaseous fuels. The basic types of combustion of these fuels and the use and operation of combustion equipment are also included.

Not only are factors such as the determination of heat balances, smoke prevention and draft requirements treated but also discussed are factors involved in the selection of fuels, the preparation of fuels for utilization, fuel handling and the transfer and generation of heat. Anthracite and bituminous coal, manufactured solid fuels, petroleum and petroleum derivatives, boilers and steam generators and furnace design are covered in separate chapters. Comparative tables are also given showing advantages, disadvantages, features, performance data and application of optional equipment.

Material is up-to-date, 50 percent being less than five years old and 80 percent being less than 10 years old. Realizing that no reference book is any better than its ability to be used, subjects have been indexed and cross-indexed so as to be readily available.

Fuel technicians, engineers and operating men, all will find this handbook a valuable source of information and data.

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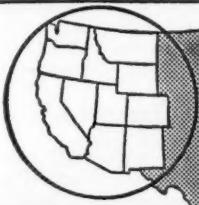
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Western States

New Mine Opened

Howard I. Young, president of the American Zinc, Lead and Smelting Co., of St. Louis, confirmed a report that the company has made an important ore discovery at its Lead Hill property in the Metaline district of Washington State. The company operates the Grandview mine at Metaline Falls, Wash.

To Extract Oil from Shale

Chemical Plants Division of Blaw-Knox Co., Pittsburgh, has been awarded a \$333,870 contract by the Bureau of Mines for the design and construction of a demonstration-scale retort for the continuous extraction of oil from shale. To be located at Rifle, Colo., the plant will be able to process from 150 to 400 tons of oil shale daily. It will employ a new and very promising "gas-combustion" retorting process developed at Rifle by the Bureau.

Sulphur Deposits Studied

The critical shortage of sulphur currently selling at \$22 a long ton, has caused increasing interest in California and Nevada sulphur deposits near Reno, Nev. Sulphur deposits have been intermittently mined in the Dixie Valley region near Fallon and in the Sulphur district northwest of Winnemucca. The Leviathan mine in Alpine County, Calif., is reported to contain large deposits of the mineral.

Western Iron Tonnage Up

All-time record shipments of iron ore from the western states in March indicate that these states, led by Utah, now threaten to stand next to the Lake Superior district in output, ahead of the southeastern and northeastern states. In March, Utah, Colorado, Wyoming, California, Texas and Missouri iron mines shipped 681,151 tons of iron ore, compared with their previous record of 631,707 tons established in March of 1949.

Utah's contribution to this latest record was 438,018 tons. Strangely enough, because of winter conditions, the western shipments exceeded those of the Lake Superior district with 581,769 tons. Corresponding figures for shipments from the southeast and

the northeast were 654,053 and 476,185 respectively. The western states shipped 15.8 percent of the nation's total in March.

U. S. Grant Mill

Plans for the erection and financing of a mill to treat ores developed on its Eastern Pacific and U. S. Grant properties near Virginia City, Mont., have been announced by Walter H. Myers, president of U. S. Grant Mining Co. Operations of the company have been on a reduced scale for the last two years pending the erection of the mill. The company, which has operated since early 1940, drove a tunnel more than 4000 ft into the Eastern Pacific property to develop ore bodies at a lower level in that historic gold producer.

Trona Plant Approved

In Cheyenne, Secretary of the Interior Oscar Chapman announced that a trona mining project in Sweetwater County, Wyo., had been approved as a defense project. The plant, to be built by the Westvaco Co., will produce soda ash from trona, an impure form of hydrous sodium carbonate. It is used in the manufacture of glass, soap, caustic soda and various chemical products. The plant will employ at least 350 people and initially will turn out 300,000 tons of soda ash annually to supply a market from Chicago to the Pacific coast.

To Sink Atlas Shaft

An agreement has been entered into by the Hecla, Newmont, New Jersey Zinc, and Atlas Mining companies for the initial purpose of sinking the Atlas shaft at Mullan, Idaho, from the 800 to the 2400-ft level. From that point crosscuts will be driven toward the possible extension of the vein. Hecla sank the three-compartment Atlas shaft to the 800-ft level, and drifted on the north side of the vein a distance of 1000 ft east, diamond drilling to the vein at frequent intervals. Hecla surrendered its purchase option on the property at the close of World War II. Present activity is due to other ore discoveries in the same mineral belt about six miles west of Atlas at the bottom of a 3000-ft shaft. Work on the Atlas development is to begin at once.

Gold Flows Again

Gold is again being produced at the historic gold camp of Cripple Creek, Colo. On May 23 two gold bricks were poured at the new Carlton mill located between Victor and Cripple Creek. The two bricks, weighing 1208.8 and 970.8 troy ounces, were the result of processing of over 6,000 tons of raw ore. Estimated value of the gold is in excess of \$63,000.

Only part of the ore on hand at the mill was refined to produce the gold. The new mill is operating at full capacity, handling 400-500 tons of rock a day. It is expected that gold bricks will be shipped at the rate of one every two weeks to the mint in Denver.

New Grandview Mine Hoist

Grandview Mine at Metaline Falls, Wash., is to be equipped with a new 200 hp hoist, operating from the surface, to replace the present 75 hp unit, according to H. F. Mills, general superintendent. The new hoist will raise ore at the rate of 600 fpm instead of the 250 fpm rate attained by the

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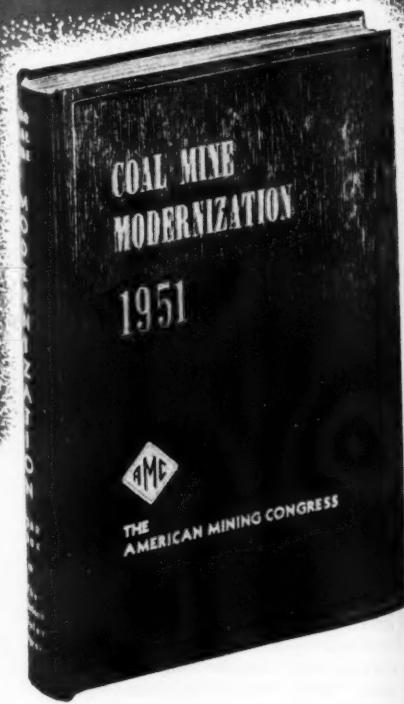
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present equipment. Production of 800 tons per day will be maintained when the new 300-ft level 100 ft below the present operating level is opened.

Clay Mining Started

Dragon Consolidated Mining Co. has commenced open pit operations at its Eureka, Utah, district halloysite clay properties. The firm sees a reserve of 100,000 tons which can be mined by 1½ cu yd shovels down to the 135 ft level. Underground mining will be carried on at the same time. The clay is shipped to the Filtrol Corp., Salt Lake City, for processing into an oil refining catalyst.

Strike New Asbestos Vein

An 18-inch vein of high-grade, iron-free asbestos fiber has been struck on the property of the Apache Asbestos Co., 31 miles northeast of Globe, Ariz., according to Louis Rayes, president of the firm. As a result of the strike, plans have been made to expand operations. The company's working force will be increased from 5 to 25 men as soon as a road can be built to the mine site from the main highway. If the showing holds, a \$50,000 mill will be built to clean the fiber.

Zinc Deposit Prospected

Spokanada Ventures, Ltd., and the Pacific Base Metals Cos. are jointly interested in diamond drilling a huge cliff of zinc ore on Kokanee creek near Nelson, B. C. The vein is a blanket deposit outcropping in an exposed cliff and is said to be 50 ft thick and 2000 ft long. Keys Construction Co. has the diamond drill contract.

Tungsten Mine Expands

Black Rock Mining Corp., a subsidiary of the Wah Chang Corp. of New York, is rapidly expanding its tungsten operations in Inyo and Mono Counties of California. Heavy equipment has been hauled 34 miles to the Black Rock mine, north of Bishop, Calif., and the installation of a plant formerly operated at the Northumberland gold property northeast of Tonopah, Nev., is scheduled in the Bishop area within a few weeks. The Northumberland mill has a capacity of 750 tons of ore daily and will be revamped to treat scheelite.

Black Rock Mining Co. is shipping about 300 tons of scheelite daily to the Pine Creek mill of Union Carbide & Carbon Co., near Bishop from the Black Rock property and is also de-

veloping the Round Valley tungsten mine in Mono County. It is also preparing to work the Scheelore mine in McGee Creek Canyon and other properties. The company is expected to become one of the world's largest tungsten producers when its various mines are operating at full capacity.

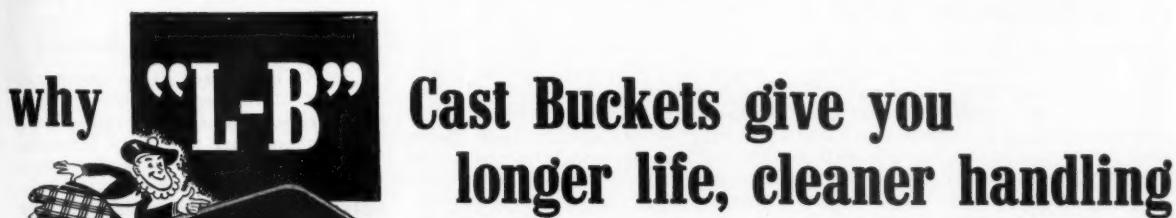
Gold Dredging Resumed

Gold dredging is scheduled to be resumed at the Greenan placers in the Copper Canyon district near Battle Mountain, Nev., by Natomas Co., of California. The powerful California-type bucket-line dredge was shut down early this year for repairs after being damaged in operations.

Equipped with 120 buckets, each with a capacity of 11 cu ft, the dredge displaces 2600 tons, is about 400 ft long from the tip of digging ladder to end of the stackers, and handles more than 350,000 cu yd of material a month. It is the only bucket-line dredge in Nevada.

Industrial Use of Jewels

More than 2,000,000 natural and synthetic sapphires a year are used in the manufacture of watt-hour meters, electrical instruments and protective relays.



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Copper Canyon

Production of lead-zinc-silver ore has been resumed from the Hornfels ore body by the Copper Canyon Mining Co. of Battle Mountain, Nev. Discovered a few years ago, the deposit has been developed to a depth of 700 ft from the Julie shaft and is the most important ore body in the mine formerly noted for its output of copper and gold. Copper Canyon was Nevada's fourth largest copper producer during World War II, when it was operated by International Smelting and Refining Co., an Anaconda subsidiary. Equipment includes a concentrating plant with a capacity of 350-400 tons of ore a day.

Northwest Gypsum Mine

Northwest Gypsum Co. recently held open house at its new mine at Weiser, Idaho, for the public's inspection of its operation. The deposit, beside the Snake River, is reached by a new road. Overburden has been peeled off of the hill of gypsum and the operators are ready to turn out 500 tons a day for the present with a larger output planned later. The gypsum is ground as fertilizer, or is processed with cement and used in building board. Fred Still is general manager of the property.

New Gold Extraction Method

Volo Mining Co. will install a carbon absorption unit at its gold property and mill west of Placerville, Calif. The unit will use a new process for extraction of gold from low-grade ores, developed by the Precious Metals Experiment Station of the U. S. Bureau of Mines, Reno, Nev. Similar units are being operated successfully at other properties. Volo Mining has operated a mill with a capacity of 400-500 tons daily at its Shaw gold property for two years. Ore is mined by a power shovel from a dike. The company has also milled ore from adjacent mines and is among the few mining concerns in the west working low-grade gold deposits at a profit.

Park Utah Finds New Ore

Park Utah Consolidated Mines Co., has hit a totally new ore body in the Ontario section of the Park City mine, Park City, Utah, while working on an interior shaft, Paul H. Hunt, vice-president, has announced. The shaft is being sunk from the 1700-foot level and raised from below. Plan was to connect the 1700-foot level with the 1500-level and use the shaft as a main outlet for a considerable tonnage of bedded lead-silver-zinc ore generally extending through three levels.

Preliminary investigations had led the operators to conclude that no com-

mercial ore existed in the path of the project and the joint sinking and raising for the shaft was commenced. The ore apparently is of good grade and miners have penetrated it for 45 ft.

Uranium Ore Found

Existence of additional high grade uranium ores and the first showing of pitchblende found in the United States was revealed by the Vanadium Corp. of America after recent development work in Colorado. Uranium ore reserves proved by the company during the past year or more at its properties in the Colorado Plateau are regarded as constituting one of the most important additions to the country's supply for this metal yet discovered.

Experimental Mines

And Quarries

(Continued from page 47)

reasons. (1) Requirements are comparatively intermittent and do not justify the expense of installing and maintaining a line from the local power supply serving the Rolla area and, more importantly; (2) students become acquainted with a type of power generating equipment that may be the sole source of supply at outlying mining operations with which some day they may be associated.

Air is compressed by a motor-driven Joy compressor or an Ingersoll-Rand semi-portable diesel compressor. Both are 2-stage, 210-cu ft capacity engines and discharge into a 50-cu-ft receiver valved to blow at 90 psi pressure. Other incidental machinery, such as a small battery-charging gasoline engine, is housed in the engine room. Heat is furnished by means of a coal stove. Diesel oil for the various engines is stored in a 1000 gal tank located outside the engine house.

Potable water is obtained by means of an air-lift pump from a 6-in. well 180 ft deep. The pump is comprised of a column of 2 in. galvanized pipe with a $\frac{1}{2}$ in. air line suspended inside. A reservoir of 1800 gal capacity, located in the well house, is sufficient to accommodate by gravity feed the necessary water requirements for operating the surface plant. It is connected also with the mine installations to serve water needs there, if desired. The diesel engine cooling tower is mounted over an exterior sump of about 1500 gal capacity.

The shop is supplied with a forge and acetylene welding apparatus in addition to mechanic's and carpenter's tools and incidental equipment. It is designed with track to make it possible to bring mine cars and tim-

ber trucks inside the building. Coal is used to heat this building too.

A change house that will accommodate 30 men is equipped with toilet and shower facilities and is heated with a forced-draft coal unit to expedite drying of mine clothes.

Ample Supplies on Hand

The warehouse is stocked with drilling equipment, including various lengths and types of drill rods, drill bits, posts and columns, jack-leg, tripod, and drilling machines as follows:

Hand-cranked Ingersoll-Rand drifter

Automatic feed Cleveland drifter

Ingersoll-Rand jackhammer

Gardner-Denver air hammer

Ingersoll-Rand stoper

Other equipment and supplies on hand are:

Gardner-Denver sump pump

Blasting machines

Pipe and track

Timber and lumber

Sundry supplies, such as lubricating oil, nails, paint, etc.

A charging panel and 50 electric cap lamps recently have been ordered and will be installed and maintained by the Mine Safety Appliances Co.

Blasting caps are stored in a concrete vault in the cap house.

Safe Practices Emphasized

Safety is stressed as an important element of mining operations and a bulletin board has been erected near the change house to display placards, announcements, and safety posters. A laboratory technician is continually at the property during the day shift on Monday through Friday of each week. He acts as a general caretaker of the plant and keeps equipment and apparatus in working order. The mine yard proper is enclosed within a 9-ft woven-wire cyclone-type fence, with two gates. The gates and buildings are locked over weekends and each night.

Transportation to the mine and quarry from the campus is accomplished by means of two station wagons. In these, a class of 30 men can be moved to the mine in about 30 min.

The Experimental Mine and Quarry Property maintained by Missouri School of Mines and Metallurgy is a valuable adjunct to campus facilities for instruction and research in mining engineering. The plant progressively is being expanded and developed at a comparatively low annual expense. Plans now are formulated to erect on the surface an ore bin and a ventilation chamber to house a 5-ft diameter, reversible flow fan.

New Tunnel Record Set

A mile and one-third long steel supported tunnel for the Utah Copper Division of Kennecott Copper Corp., was driven 803 ft in 27 working days by the Utah Construction Co., besting the old world record of 775 ft in the same time. There were no major mishaps or injuries, although 125 men were employed on the project.

Driven from the main line in Bingham Canyon to a point 50 ft below the present floor of the open pit mine, the tunnel is standard railroad size, 21 ft wide by 25 ft high. When completed it will carry more tonnage per day than any other principal rail tunnel in the country.

Ore now travels the 6040-ft level haulage tunnel. The new bore on the 5840 ft level will carry all ore mined below the level of the present tunnel.

To Reopen Quicksilver Mine

Reconditioning of the Cordero quicksilver mine near McDermott, Nev., is progressing. Crews are repairing the shaft and preparing main workings for resumption of mining. Located in Nevada's foremost cinnabar area and owned by Cordero Mining Co., subsidiary of Sun Oil Co., the property was operated on a major scale during World War II. Mercury deposits were mined to a depth exceeding 600 ft, the deepest ever developed in that state, and averaged 600 flasks a month.

Mine to Grow Own Timber

Bunker Hill & Sullivan Mining & Concentrating Co. consumes about 30,000,000 ft of timber per year for mining purposes. The company has now started its own tree growing industry by planting, as an experiment, 2000 young Douglas Fir trees in an area on Bear Creek. If the experiment is successful, 25,000 to 50,000 trees of various kinds will be planted in areas on Bear, Pine and Latour creeks in the Coeur d'Alene area of northern Idaho, company officials announced.

Hazel Creek Mine

Hazel Creek mine, located in the Sly Park area on the East Belt of the great Mother Lode country of California, is reported developing into an important and consistent gold producer. The property is controlled and operated by Hazel Creek Mining Corp. and was recently equipped with a ball mill and flotation plant capable of treating 30 tons of ore a day.

Water for mining and milling is obtained from Empire or Hazel Creek. The property was located about three years ago in a virgin area of the East Belt, noted for its

1951 Metal and Non-metallic Mineral Mining Convention

State Chairmen to Meet in Los Angeles
in Mid-July

A MEETING at the Biltmore Hotel in Los Angeles has been called by Ross D. Leisk, National Chairman of the Program Committee, to permit the State Chairmen to formulate plans for the 1951 Metal and Non-metallic Mineral Mining Convention to be held under the auspices of the Western Division of the American Mining Congress, October 22-24. These plans will cover the most important problems on the political and economic fronts as they affect the mining industry and also those confronting operating men all over the nation.

General arrangements for the enjoyment of visitors to the Convention are going forward to make this, the first Los Angeles meeting since 1938, an unequalled success. Harvey S. Mudd, Chairman of the Western Division, aided by Vice-Chairmen Peter Colefax, president, American Potash Co., and N. K. Anderson, president, Alloy Steel and Metals Co., has appointed committees to attend to the many details that go into a successful meeting.

Henry Mulryan, executive vice-president and general manager, Sierra Talc and Clay Co., heads the Trips Committee with G. A. Beckett, president, Riverside Cement Co., and R. V. Coons, American Potash Co., as vice-chairmen. J. A. Hartley, president, Braun Corp., is chairman of the Publicity Committee and E. D. Arthur, mining commissioner, Los Angeles Chamber of Commerce, is vice-chairman. The Welcoming Committee is chairmanned by Wm. G. Brownrigg, general manager, Golden Queen Mining Co., and V. J. Hayek is vice-chairman. The Ladies' Committee is headed by Mrs. H. J. Clark.

Among the functions planned for the Convention are the Welcoming Luncheon, a dinner-dance and the annual banquet. There will also be trips to important mining operations and the scenic beauties of southern California to round out a busy week.

All the hotels of Los Angeles will have the welcome mat out for AMC convention goers. Reservations should be made direct with hotels—and as soon as possible.

The 1951 Metal and Nonmetallic Mineral Mining Convention is a must for all mining men.

high grade gold deposits, and its operation promises development of a long neglected district in El Dorado County. Several shipments were made to the mill operated near El Dorado by Volo Mining Co. last year for tests before the new plant was installed.

To Build Rotary Kilns

Two rotary kilns, said to be the largest ever to be engineered and manufactured west of the Mississippi, will be built for Manganese, Inc., Henderson, Nev., by Standard Steel Corp., Los Angeles. Ten ft in diameter and 150 ft long, the kilns will be installed as part of a \$2,500,000 manganese ore plant at the site of the old Three Kids mine near Henderson.

Garnet Mining Co. Formed

With the end and aim of mining garnets, Garnets Inc., has been duly formed and incorporated at Spokane, Wash. Incorporators named in the official papers of the new mining corporation are: Henry C. Craig, 411 Hyde Building, Spokane; Percy C. Stanley, RFD Box 6760, Issaquah, Wash.; A. B. Lafferty, the Liberty Transportation Co., Coeur d'Alene, Idaho.

Colorado Tungsten Output

Efforts are being inaugurated by the federal government to break a bottleneck that is preventing boom production of tungsten ore from Colorado's Boulder County mines. The regional director of the bureau of mines, J. H. East, Jr., of Denver, pointed out that in spite of the terrific demand for the mineral, mine bins in Boulder County are full of ore that cannot be sold even at the government's support price of \$63 a ton. East blamed this on three factors:

(1) Lack of milling capacity. The Wolf Tongue mill at Nederland is the only one of any size now actually operating and its total capacity is only 36 tons a day.

(2) Reluctance of mill operators to enlarge their facilities and buy crude ore at schedules based on support prices because both the investment and working capital requirements would be high.

(3) Much of the county's tungsten concentrate needs additional processing to meet federal specifications.

It has been proposed that the government set up purchasing depots, and P. R. Bradley of the Defense Minerals Administration has taken the suggestion back to Washington. Another proposal calls for expansion

of the Wolf Tongue mill to handle 100 tons daily. Also the Teal mill would be enlarged under this suggestion to process 60 tons a day. Mine operators claim they can produce 150 to 200 tons daily with ease, if there were milling facilities available.

Chrome Program Planned

A 5-year chrome development program has been worked out in tentative agreement with the federal officials, F. I. Bristol, president of the Oregon Mining Association recently announced. This plan includes purchase of chrome ore and concentrates in grades over .42 percent oxide and with a chrome-iron ratio of at least 2 to 1, with standard 48 percent ore with 3 to 1 ratio pegged at \$115 per ton for lump ore delivered at the Grants Pass, Ore., stock pile. Premium ore will rate extra.

New Smelter

Consolidated Smelting & Refining Corp. expects to have a smelter in operation at Hailey, Idaho, by next October. The plant is designed to treat silver, lead and zinc ores of the district. In early days only the high grade silver-lead ores that could be shipped to distant smelters was mined and a large tonnage of low grade ores was left in the mine workings and old surface dumps.

Mining Association Moves

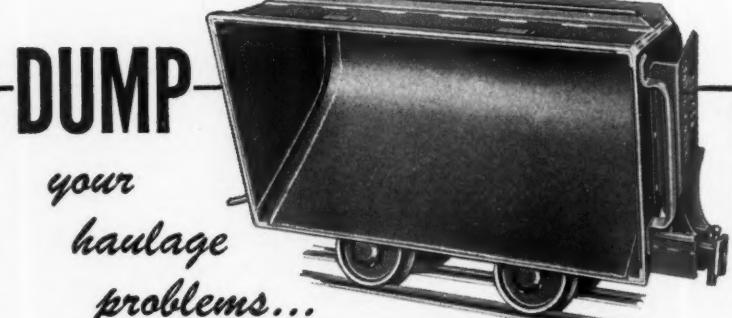
Expanding its activities, the Northwest Mining Association, which has been located at West 512 First Ave., Spokane, Wash., has recently moved to more commodious quarters at West 522 First Ave., Spokane. David E. Watson, vice-president, and Howard F. Cameron, office manager, are in charge of the new office.

Barite Ore Shipped

Barium Products is shipping barite from a property in the Almanor district to its plant at Modesto, Calif. Material is mined from a vein developed by a tunnel and raises. The property was reactivated late in 1950 after almost two years of idleness.

Manganese Shipment

Shipment of 2500 tons of low-grade manganese ore from the Artillery Peak district in Arizona to the Bureau of Mines pilot plant at Boulder City, Nev., is scheduled to start soon. The pilot plant, built at a cost of \$600,000, is to test a new concentration process. If the process proves successful, the nation may become independent of foreign sources of manganese.



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C.S. Card Iron Works Co.



Denver 1, Colorado

Reduction Plant Started

Construction has begun on a reduction plant near Wenatchee, Wash., by the Aluminum Co. of America. The good water supply is one of the chief reasons that Alcoa located its new reduction plant there. Francis LaFollette, of the Great Northern Railroad, who is leasing the land to Alcoa, purchased the tract for an investment in 1926.

Colorado Coal Output Drops

Colorado coal production, continuing its steady decline because of use of gas and electricity, sank to 4,274,887 tons last year, according to the state bureau of coal mine inspection. This represents the lowest production of coal in the state since 1898. The all time high was in 1918 with 12,658,055 tons. There is still a supply of easy-to-mine coal that would fill the states' needs for the next 25,000 years and enough to supply the nation for centuries. With the projected greater industry of Colorado and the possibility of synthetic fuel plants being established to extract oil from coal, there is hope for the revival of the coal industry.

Montana Ore Project

The engineering experiment station at Montana State College has a contract for \$11,000 with the Army Signal Corps for a two-year project to develop another use for Montana manganese ore. The fund will be used in an attempt to develop commercial process for producing battery grade manganese dioxide. Manganese dioxide makes lighter and more powerful dry cells. The research is being done in Montana because of the facilities existing and the proximity of the ore.

DMA Loan Granted

Mines Management, Inc., has been granted one of the first DMA government loans for new mine development. The loan, \$12,000, which is to be matched by the mining company is for further development of the Iroquois mine in the Metaline-Salmo area of Stevens County, Wash. The enterprise has already developed a large blanket type vein of zinc-lead ore.

Providence Mine

Rehabilitated and equipped with new mining machinery and a mill by the Providence-Tuolumne Gold Mines Co., at a cost of \$500,000, the Providence mine near Tuolumne, Calif., is again one of the leading gold producers on the Mother Lode. The mill is designed to treat 150 tons a day. The Providence was formerly worked

to a depth of 1470 ft, but mining is currently restricted to workings above and on the 600-ft level. The new tunnel, extended from the 600-ft level, drains the property to that depth, eliminating costly pumping and facilitating mining of virgin areas.

A. Vaninini, president of Providence-Tuolumne, said recently that sufficient ore is exposed to keep the mill running steadily for many years.

Consider Sulphur Recovery

P. C. Fedderson, superintendent of the Bunker Hill smelter, Kellogg, Idaho, announced that the company is seriously considering installing a process for the recovery of sulphur from waste smelter fumes and gases. Installation of the process would be at both the Bunker Hill smelter and at the nearby Sullivan zinc plant.

With the Defense Agencies

(Continued from page 53)

to file CMP forms shortly, indicating that allotments may be made to them in the fourth quarter of this year.

During the third quarter transition period from the present DO-rating system to CMP operation, CMP preference-rated orders will take precedence over other DO priorities.

The importance of minerals and metals was pointed up by NPA late in June, when it issued a list of basic materials and alternates, classifying some 550 materials according to their availability. It listed as being in very short supply — aluminum, lead, copper, tin, zinc, nickel, tungsten, high alloy castings, stainless steel and wire, and said that vanadium, chromium, manganese, and certain types of steel were in "tight" supply.

Summer Fuel Buying Program

Interior Secretary Chapman, Solid Fuels Administrator Connor, Defense Transport Administrator Knudson, and Mobilization Director Wilson have issued strong pleas to Federal, State, and local procurement authorities and to the general public to stockpile fuels this summer in order to prevent a severe strain upon transportation facilities this fall and winter. All of these officials have pointed out the advantages of obtaining fuel supplies in this period.

Chapman has also written the Governors of the various States urging each one to appoint a member of his staff as a fuel conservation director and to cooperate in promoting the program of summer fuel buying.

Minerals Exploration Aid

The Defense Minerals Administration has revealed that a total of 461 applications for exploration assistance have been received since the program went into effect in April. The major portion of these are for copper, zinc and lead exploration projects. Some applications covering exploration projects for manganese, tungsten, mercury, monazite, beryl and mica have also been received.

Contracts covering 12 projects al-

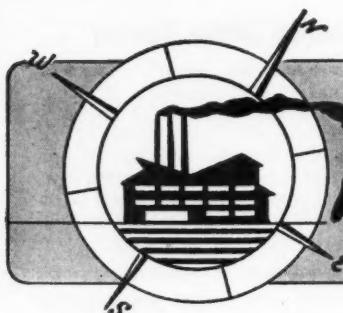
ready have been signed and work on these has begun or is in advanced stages of preparation. About 10 others have been tentatively approved.

DMA Administrator Boyd said that exploration contracts have been entered into as of June 18 for the following projects, the Government's share of the cost being \$791,776: Mines Management, Inc., Iroquois mine, Stevens County, Wash., lead-zinc; Callahan Zinc-Lead Company, Akron Unit, Gunnison County, Colo., lead-zinc; David G. Wood, Last Laugh mine, Gardnerville, Nev., tungsten; New Park Mining Company, Mayflower mine, Keetley, Utah, lead-zinc; Chief Consolidated Mining Corporation, Eureka, Utah, lead-zinc; Combined Metals Reduction Company, Rush Valley project, Utah, lead-zinc; Lupton Mining Company, Grizzly mine, Georgetown, Colo., lead; Westmoreland Manganese Corporation, Batesville, Ark., manganese; Taylor Knapp Company, Philipsburg, Mont., manganese; Bristol Silver Mines Company, Pioche District, Lincoln County, Nev., zinc; Dodgeville Mining Company, A. R. Jones property, Iowa County, Wis., lead-zinc; and Kelly Camp Mine, Eureka Mining District, Ferry County, Wash., tungsten.

DMA has also disclosed that 45 facilities have been certified as being eligible for accelerated amortization under terms of the Internal Revenue Act. The agency estimated these facilities would bring about the following increases in annual production: Copper, 139,000 tons; zinc, 90,000 tons; lead, 35,000 tons; magnesium, 36,000 tons; molybdenum, 8 million pounds; cadmium, 1.2 million pounds; aluminum, 550,000 tons; and iron ore, 15½ million tons.

On June 30, DMA took over complete allocation of molybdenum ore, and anyone wishing to deliver or accept delivery of molybdenum must now obtain authority from that agency to do so.

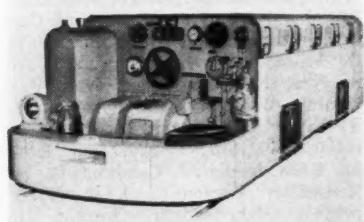
Meanwhile, the General Services Administration has amended its regulations governing the domestic tungsten purchasing program to provide that it will terminate when 3 million short-ton units of contained trioxide have been delivered to and accepted by the Government, or on July 1, 1956, whichever occurs first.



Manufacturers Forum

Haul Coal with Diesel

A 10-ton diesel locomotive for underground haulage, introduced to the mining industry at the Coal Show, has been developed by National Mine Service Co., Beckley, W. Va. The



locomotive is approved by the U. S. Bureau of Mines for underground use, and one has been placed in operation in West Virginia.

Safety of the miner has been in mind throughout the locomotive design. It is flameproof and operates with an excess of air to assure freedom from carbon monoxide. No part of the exterior becomes warmer than 400 deg. F., and final exhaust temperature is less than 160 deg. F.

Increased Tire Life

After recent tests, Goodyear Tire and Rubber Co. claim substantial increases in tire life and lowered op-



erating costs for tires used in underground mining and run at low speeds—less than 5 mph—may be accomplished by filling tires with water instead of air.

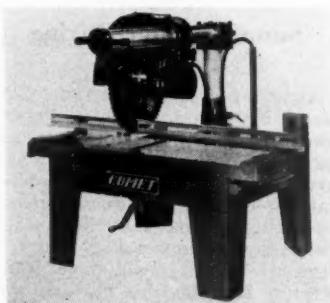
Advantages are numerous. Water-filled tires maintain a constant pressure since there is no seepage as in

air-filled tires. Operators report that they ride and steer better than air-inflated tires. Rolling resistance is decreased, which decreases power consumption.

Tires are water-filled with a special high-pressure, positive-displacement pump available from shuttle car manufacturers.

Comet Timber Cutter

Consolidated Machinery & Supply Co., of Los Angeles, has recently introduced a large radial arm saw which will cut or miter construction timbers up to 17 by 17 in. This machine, the Comet Timber Cutter, was designed primarily for use in mining, bridge building, shipbuilding and other heavy construction work.

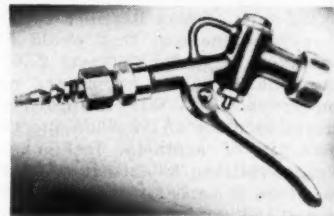


The saw assembly is mounted on a rigid arm of hardened steel tubing supported by an adjustable steel column. Eight ball bearing rollers allow the saw to move forward and backward on milled tracks in this arm. Adjustment for depth of cut is made through a screw gear raising device, which raises or lowers the column. The controls are handily located at the front of the machine. Adjustment for miter is made by rotating the column to the desired angle. Width of cut-off is controlled by a manually operated chain drive attached to the saw assembly. This drive gives smooth positive cutting action, the manufacturers claim.

Further details may be obtained from Consolidated Machinery & Supply Co., Ltd., 2031 Santa Fe Avenue, Los Angeles 21.

Fog Gun Marketed

A unique fog "gun" developed by Bete Fog Nozzle, Inc., of Greenfield, Mass., makes it possible for factories and mines to convert ordinary garden hose into a mobile and effective



inside fire fighting weapon—a smaller edition of the fog equipment used by practically all fire departments.

With the new gun-type nozzle, a tap pressure of only 30-120 lb will produce an effective fog that will instantly blanket and extinguish small fires, according to the manufacturer. Such fog is effective against practically any kind of fire—oil, textile, electrical, wood, etc. The nozzle has instantaneous trigger action and a positive shut-off.

The new fog gun is excellent for many other applications, and is said to be effective for spraying lubricants and other solutions.

Aids Material Movement

Three new patents were recently received by E. F. Peterson, president of Martin Engineering Co., Kewanee, Ill., on the Peterson "Vibrolator," giving the company exclusive rights in



the United States to the manufacture of this new type vibrator.

The "Vibrolator" is used to aid the movement of such materials as grain, coal, granular chemicals, flour, cement, food products and other ma-

terials that arch and resist movement toward the outlet of hoppers and bins, or where wet mixtures tend to entrain air. It effectively vibrates the storage bin and causes materials to flow steadily toward the outlet. The all-directional vibration does not damage the hopper or storage bin.

Claimed to be extremely versatile, the vibrator can be mounted easily in many different ways and comes in different sizes to allow for variance in operating conditions, materials, and equipment. It is virtually noiseless in operation, self-lubricating, and requires no maintenance, the manufacturer says.

CO Protector

For emergencies in air contaminated by carbon monoxide, the Mine Safety Appliances Co., Pittsburgh,



has developed a new "Self-Rescuer," a small, compact, lightweight device to protect the wearer for 30 min. in CO concentrations found after fires or explosions in mines or other underground or enclosed areas. The apparatus has been tested and approved by the U. S. Bureau of Mines for self rescue from carbon monoxide contaminated air.

One of the newest pieces of personal protective equipment MSA has developed for the mining industry, the Self-Rescuer is simple to use and compact enough to be carried personally. Quantities of them can be stored in metal "cache assemblies" at strategic locations throughout a mine, or single units can be carried in a leather case.

The Self-Rescuer contains a hermetically sealed chemical cartridge, filled with "Hopcelite" and a drying agent, which is replaceable after use. The "Hopcelite" oxidizes poisonous carbon monoxide to harmless carbon dioxide.

Further information on the Self-Rescuer may be obtained without charge from the Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

Truck Prices Down

International Harvester recently announced a reduction in the list prices of its light models of motor truck chassis and attachments. The downward price adjustment covers the company's L-110, L-120, L-130, L-150, and L-160 model series, or its smallest pickup trucks through those of 16,000-lb rated capacity.

The chassis price reduction, which ranges from 3.4 percent to 6.4 percent, results in total reductions of \$50 to \$145 on former list prices. The prices of all attachments for these models were reduced an average of 2.25 per cent. Prices of the company's larger models of motor trucks and attachments manufactured at the Fort Wayne plant will remain unchanged.

Running-Time Recorder

A new line of Running-Time Recorders has just been announced by The Bristol Co., Waterbury 20, Conn. A chart record gives the total "on" time in hours, minutes, and seconds for a given period. "Time off" periods are also shown on the chart as well as the time at which they occurred. Running-Time Recorders are furnished in models suitable for wall, flush-panel or portable use. Complete information on models, ranges, specifications, and uses are given in Bulletin OP1504.

Centrifugal Pumps

Chain Belt Co. of Milwaukee has just placed on the market a new line of self-priming centrifugal pumps. Capacities range from 4000 to 90,000 gal per hour.

An outstanding feature of the new Rex Pump is the Impeller Shaft Seal.



This Seal is never subjected to pumping pressure with the result that considerably longer Seal life and more trouble-free pump operation is obtained.

A new catalog is available, which further describes the pump in detail.

For further information on the new Rex Pump line, write for Bulletin 51-27, Chain Belt Co., 1600 West Bruce Street, Milwaukee 4, Wis.

CATALOGS AND BULLETINS

BUCKET LOADERS. *George Haiss Mfg. Co., Inc., division of Pettibone Mulliken Corp., 141st to 144th St. on Park Ave., New York 51.* The description, specifications and applications of Haiss Bucket Loaders is included in this bulletin. Either wheel or crawler mounted, these loaders can be equipped with a screening unit to separate feed material into two products.

BUSHING STANDARDIZATION. *General Electric, Schenectady 5, N. Y.* A new standardization program which has successfully replaced more than 1000 different types of transformer and circuit breaker bushings with only 38 standard bushings is described in this new release from General Electric Apparatus Dept. numbered GEC-715. Company engineers state that almost all new equipment will be designed with the standard bushings. The saving in inventory investment and storage space is emphasized.

CHAINS AND SPROCKETS. *Jefrey Manufacturing Co., Columbus, Ohio.* Write this company for new catalog No. A418 covering its complete line of chains and sprockets for new and replacement service on elevating and conveying equipment and for drives.

COAL CLEANING BULLETIN. *McNally Pittsburg Mfg. Corp., Pittsburg, Kans.* A complete description of the company's three new coal cleaning units, the Tromp Dense Media Bath, Mogul Super-Capacity Baum Type Jig and the Brusset Vacuum Jig for dry cleaning. In addition, drawings and illustrations pertaining to all these various coal cleaning processes are included. Bulletin 451 may be had free, on request, from McNally Pittsburg.

DIAMOND CORE DRILLS. *E. J. Longyear Co., Foshay Tower, Minneapolis, Minn.* Revised Bulletin No. 71 contains specifications and operating data on Longyear Wolverine Diamond Core Drills. Designed primarily for underground drilling, the Wolverine has a capacity of 800 ft and recovers an EX size core $\frac{1}{8}$ in. in diameter. Copies of the bulletin may be obtained by writing the company.

DIESEL CRAWLER TRACTOR. *International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.* This catalog contains detailed specifications and information on how the International TD-9 diesel crawler tractor develops and applies its 40.5 drawbar horsepower. It may be had by requesting form CR-313-A from the company.

HEAVY-MEDIA COAL PREPARATION. *American Cyanamid Co., 30 Rockefeller Plaza, New York 20.* A 36-page book, "Coal Preparation," covering the fundamental principles of the Heavy-Media Separation has been issued by American Cyanamid's Mineral Dressing Division. Fully illustrated operating plants, flow schemes and other useful data are available, in this booklet, to every producer interested in coal preparation plants.

NEW MODELS EARTHMOVING TRACTORS. *Baker Manufacturing Co., Springfield, Ill.* Engineering Bulletin No. 804, recently released by this manufacturer, describes new bulldozers, graders, builders and root rippers, their new designs and performance features.

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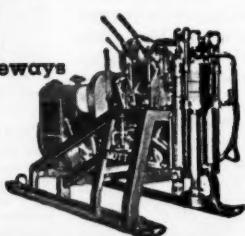
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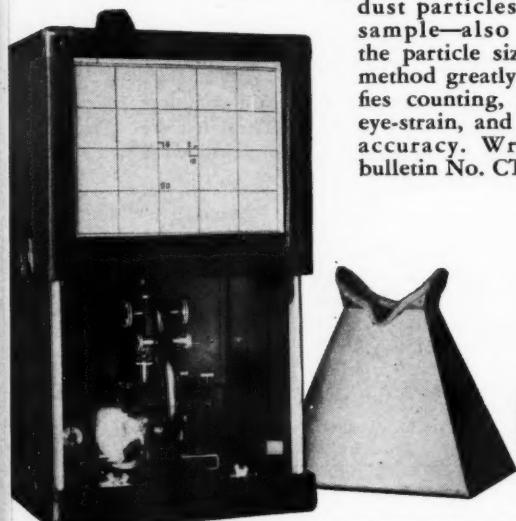
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